UWV Configuration Control Group (CCG)
CCG DSN Unification Task

Phase 1

Peer Review

Corrected Copy as of 01/09/2002

November 12, 2001

Agenda

Introduction	M. S. Esquivel	9:00 a.m. - 9:10 a.m.
Implementation Plan	T. E. Anderson	9:10 a.m. - 10:10 a.m.
Cost and Schedule	M. S. Esquivel	10:10 a.m. - 10:15 a.m.
Board Discussion	All	10:15 a.m. - 10:30 a.m.

Peer Review Board Members

Name	Affiliation
Art Freiley, Chair	UWV SSDE
Neil Bucknam	UWV CDE
Paul Cramer	UWV SSE
Manny Loria	UWV OE
Harout Matossian	CCG OE
Doug Hofhine	GDSCC SSE

Introduction

- This review is a Peer Review for **Phase 1** of the **CCG DSN Unification Task**.
  - The purpose of **Phase 1** is to upgrade the Configuration Control Group at the 34-m BWG Antennas DSS-24, -34 and -54 to the ILA/CJB H/W Assemblies.
  - The format of the Peer Review is based on the following documents:
    - JPL Standard for Reviews, D-10401
    - *Guidelines for SCD Reviews*, 813-101, Rev. A (2 March 2001) Section 5.
- Review's Objective (813-101, Rev. A Section 5.1)
  - The purpose of a product Peer Review is to review a partial or complete product (requirement, design, test design, code module, etc.) during the development process to ensure its correctness and completeness.

Success Criteria

- The review board is able to conclude that:
  - The Phase 1 Work Unit is ready to begin the implementation (procurement, assembly and test) and delivery (installation and acceptance test) phase.
  - The technical design, schedule plans and cost estimates are of sufficient quality to make a formal commitment to the **CCG DSN Unification Task**.
  - Risks, dependencies, and potential problem areas, if any, have been identified.
  - Implementation Plans are consistent with TMOD's resources and design & development practices.

CCG Functions / ECO Modkit #'s

- The Configuration Control Group (CCG) is a set of Hardware assemblies and Software Program Elements of the UWV.
  - Domain Subsystem # is 110.1 as listed in the 820-061 Document
    - 110.101 Configuration Control Group (CCG) Hardware
    - 110.102 Microwave Generic Controller (UGC) Software
    - 110.104 Microwave Programmable Logic Controller (PLC) Software
    - 110.105 Microwave Generic Controller (UGC) Tables
    - 110.403 34m BWG Feed Equipment Group (FEG)
- The CCG functions are to:
  - allow the NMC Operator to automatically Monitor & Control the UWV equipment as needed for an Uplink and/or Downlink Track
  - interlock all the transmitter beams based on the status of UWV and other S/S equipment (for personnel safety and equipment protection)
  - inform the ETX of Antenna Elevation Status for Drive interrupt
  - provide Monitor Data values of the UWV configuration status to the NMC

Purpose of Phase 1

- The DSN 34-m BWG Antennas have two (2) different versions of CCG H/W installed.
  - DSS-24, -34 and -54 have the first generation hardware (SIMs and UIAs) that were installed when the antennas were first built. The components of these assemblies are now obsolete and impossible to maintain.
  - DSS-25 and -26 have the second generation hardware (CJBs and ILA) which were developed as part of the *DSN CCG Upgrade Task*. Similar hardware is also in operation in all 34-m HEF and 70-m Antennas and will be installed at DSS-55.
- Phase 1 Proposed Change
  - Implement a uniform design and configuration of CCG H/W and S/W at all DSN antennas. The ILA and CJB H/W will be utilized.
  - Procure, Assemble, Test, Deliver and Install the CJB/ILA H/W assemblies at DSS-24, -34 and -54.

Phase 1 Proposed Changes

- Upgrade the version of the Microwave Generic Controller (UGC) executable program at DSS-24, -34, -54 and the 34-m HEF antennas from **3.0.5** to **3.0.6**. The UGC Tables for these antennas will also be updated.
  - This change makes all UGC executable programs the same at all antennas and avoids any confusion that may arise when UGC Table Updates are done in the future (i.e. *Ulysses Elevation Interlock Override* removal, etc…)
- Upgrade the PLC Ladder Logic Programs at the 34-m HEF antennas and DSS-43 from the DOS-based *PLC-500 A. I. Series* software application to the Windows-based *RSLogix 500* software application.
  - This change makes all PLC Ladder Logic Programs the same at all antennas and avoids any confusion that may arise when PLC Ladder Logic program Updates are done in the future (i.e. *Ulysses Elevation Interlock Override* removal, etc…)
- The S- and X-band Test Signal Switching Assemblies (TSSAs) will be modified to reduce the number of coaxial switches under CCG monitor/control.

Benefits of Phase 1 Implementation

- The *CCG DSN Unification Task* ***Phase 2*** benefits because the new Microwave Subsystem Controller (USC) being developed will be designed to interface with ILA/CJB Hardware only.
- The *20-kW BWG X-band TXR Upgrade* Task benefits because the interface between the UWV CCG and ETX HVPS is only between one common set of hardware (ILA) not two (ILA and UIA).
- Station personnel benefit because there is only one uniform set of CCG H/W assemblies to operate and maintain.

UWV CCG Interfaces with other Subsystems

Software Interfaces	Input Information	Output Information	Action / Affected Task
BVR	Monitor Data w/ BVR configuration	Monitor Data w/ UWV configuration	None
NMC	Link ID, ODs (MON protocols)	Monitor Data w/ UWV Configuration & TXR Status (MON protocols)	None
Hardware Interfaces	**Input Information**	**Output Information**	**Action / Affected Task**
ANT	Mirror Positions, Dish & Shroud Hatch positions, Elevation Status	Transmitter Beam Status	Modify existing Interface Document / *DSS-55 Electronics Task*
FTS	Universal Time (UTC), Day of Year (DOY)	N/A	Modify existing Interface Document / *DSS-55 Electronics Task*
FAC (FAC-11-501D)	***M/M F.O. Communications Signals***	***M/M F.O. Communications Signals***	***Modify existing Interface Document to Add DSS-34 and -54 antennas/ Phase 1***
DLN (SPC LAN)	Monitor Data (MON Protocols)	Monitor Data (MON Protocols)	Modify existing Interface Document / *DSS-55 Electronics Task*
ETX	Transmitter Beam & Transmitter Voltage Status	UWV Interlock, Transmitter Routing Status, Elevation Status	Modify existing Interface Document / *20-kW BWG X-band TXR Upgrade Task*

UWV CCG Requirements Compliance Matrix

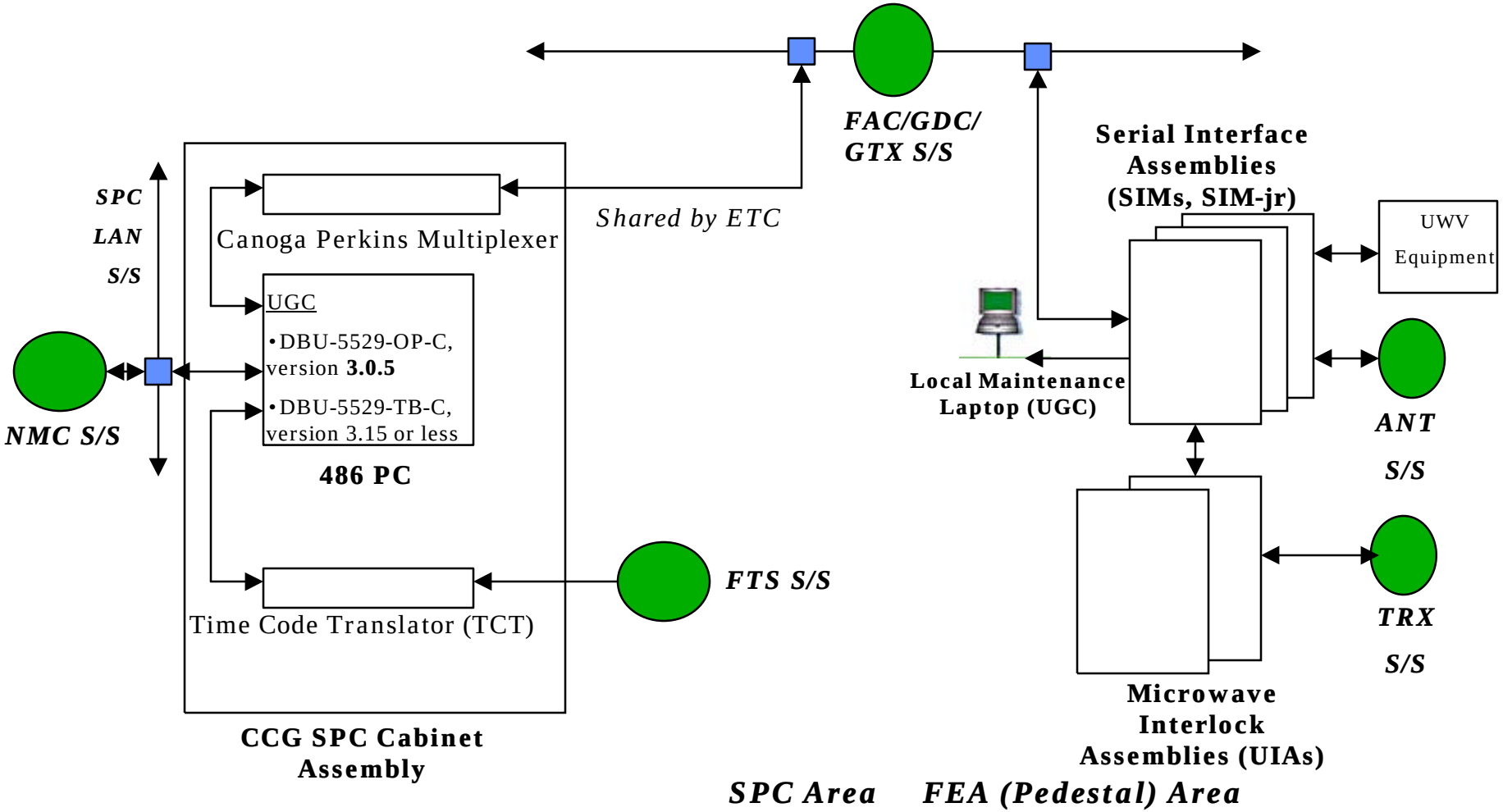
Requirements	Requirements Documents	Compliance? [Y/N]	Compliance Method
UWV subsystem: • Configuration Monitor & Control • Configuration Display at LMC/NMC	1. DSCC Antenna Microwave Subsystem, Functional Requirements Document, 824-016, Rev. F, 03/01/1997 Section 3.2.6 2. 828-1, Rev. 5 Document	**Yes** (see back-up viewgraphs)	By Acceptance Testing. The CCG is currently operational in the DSS-25 and -26 34-m BWG Antennas as well as the 34-m HEF and 70-m subnets.

• The CCG Software Program Element (*Microwave Generic Controller, UGC, DBU-5529-OP-C, version 3.0.6*) is a legacy assembly. It follows the 890-132 and 133 standards.

Existing CCG H/W Topology at DSS-24, -34 & -54

- First Generation CCG architecture in operation at the DSS-24, -34 and -54 34-m BWG Antennas
  - Microwave Interlock Assembly (UIA)
    - 1 per frequency band
    - Hardwired mechanical relays are used to monitor/interlock Water-Load Switch, Ambient Load Switch and Dichroic Plates.
  - Serial Interface Module Assemblies (SIMs)
    - 4 at each BWG antenna
    - Use obsolete Dutec I/O modules for monitor & control of UWV equipment
  - Interconnect J-box Assembly (SIM jr.)
    - Used to monitor closures (Dish Hatch, Shroud Hatch, etc…)
  - UGC Computer
    - Obsolete 486 PC computer with obsolete IBM WARP 3.0 OS/2 Operating System
      - UGC executable version 3.0.5
  - SPC to Pedestal Communications Equipment (*shared by ETC*)
    - Obsolete Canoga Perkins Multiplexer

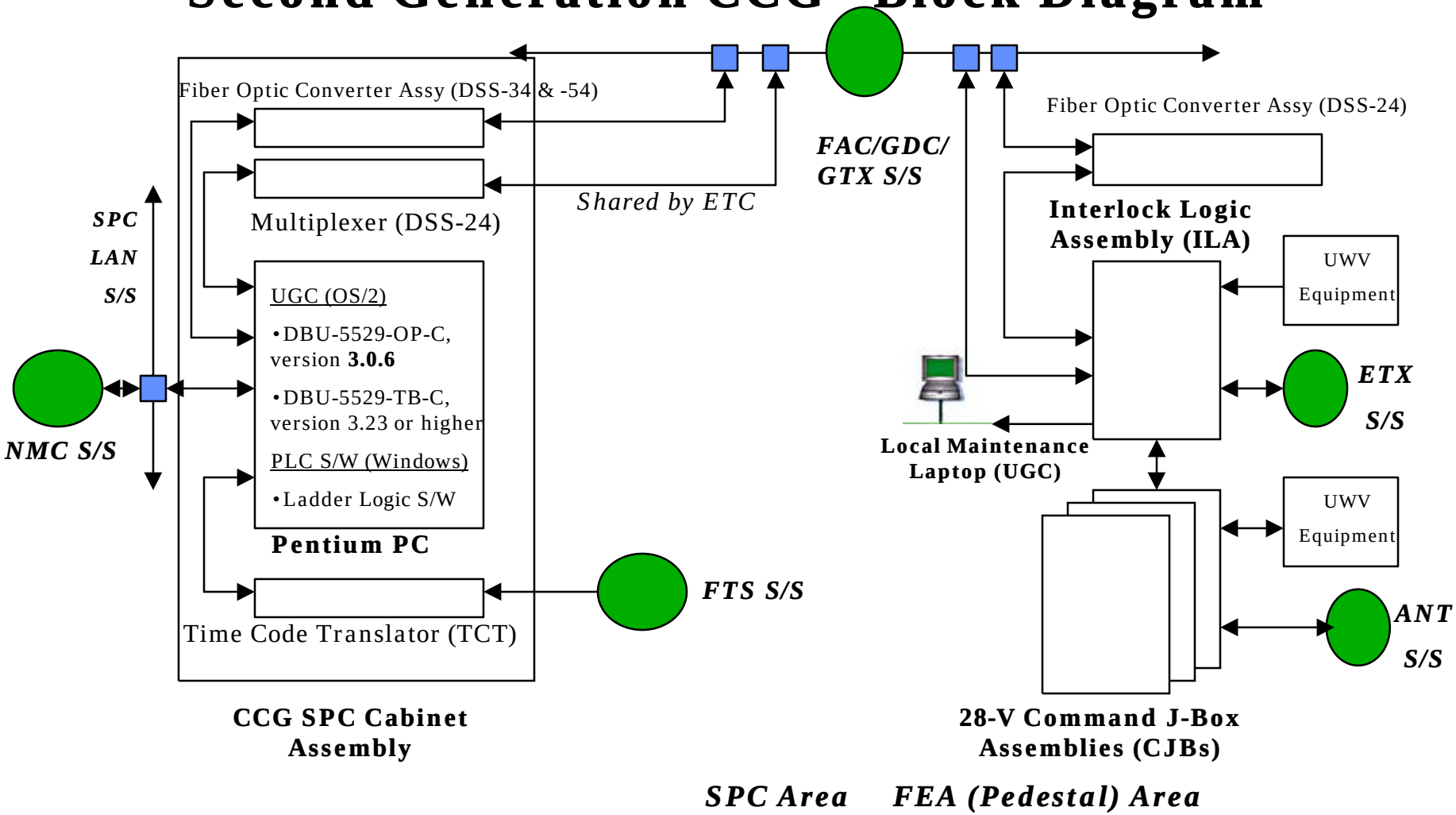
First Generation CCG - Block Diagram



Proposed CCG Hardware Topology

- Second Generation CCG architecture in operation at DSS-25, -26, 70-m and 34-m HEF Antennas
  - Interlock Logic Assembly (ILA)
    - one per station
    - used to monitor/inhibit UWV equipment and interlock up to 6 TXR beams
  - Command J-Box Assemblies (CJBs)
    - 115-v CJBs at 34-m HEF and 70-m Antennas
    - 28-v CJBs at 34-m BWG Antennas
    - each CJB monitors/controls a maximum of 7 switches
    - the 28-v CJBs monitor 1 doors and 11 closures
  - Pentium PC
    - Dual-boot operating system (Windows and IBM WARP 3.0 OS/2)

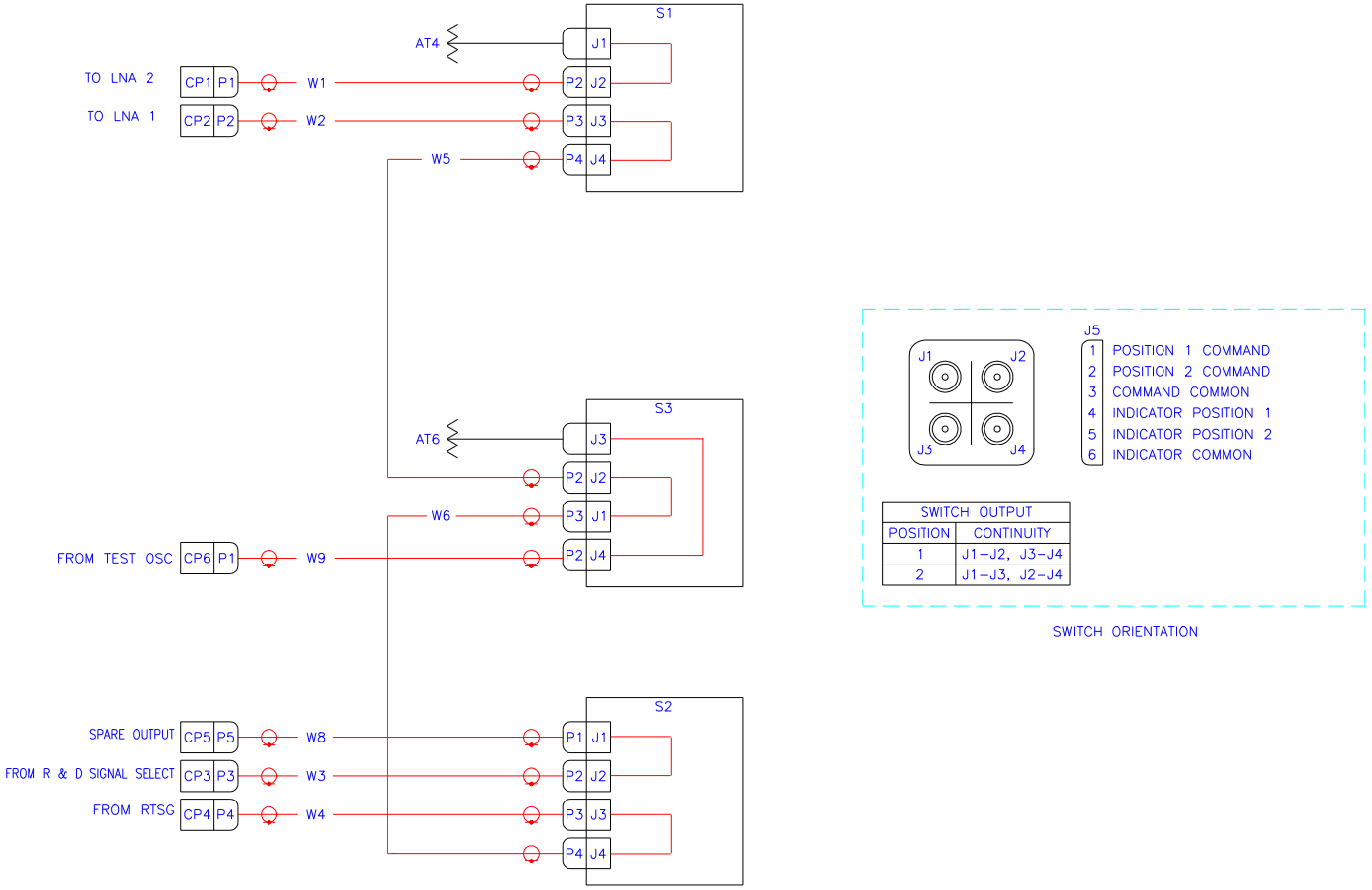
Second Generation CCG - Block Diagram



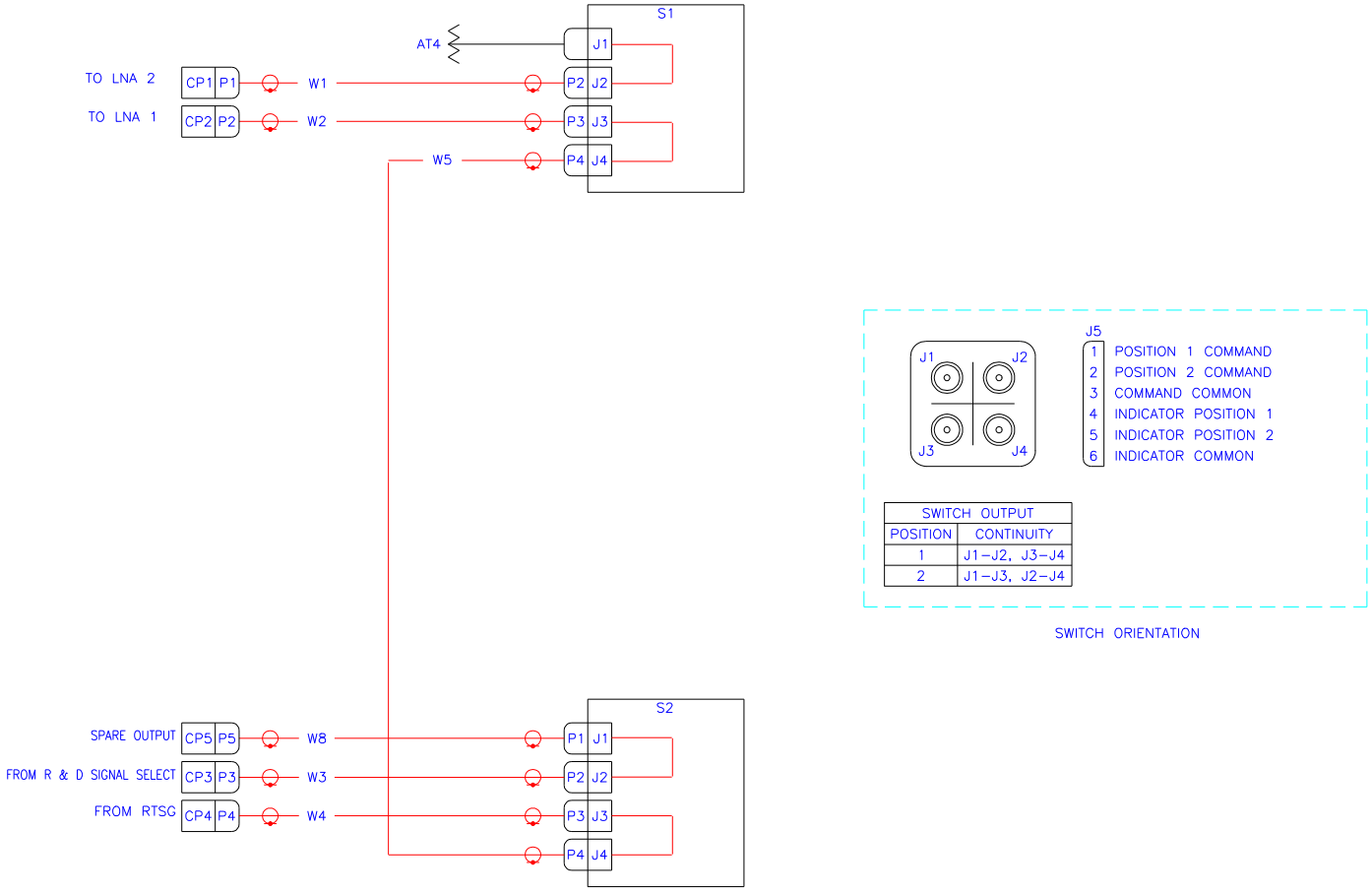
TSSA Modifications

- S- and X-band Test Signal Switch Assembly (9606197)
  - Contains 3 switches
  - S1 is a normal 2-position switch which routes the input test signals to LNA1 or LNA2
  - S2 and S3 choose the input test signals to be routed to S1
  - S2 and S3 are wired to act as one 3-position switch to allow for up to 3 test signal inputs.
    - There are only two test signal inputs in the system now
- The modifications to the TSSA are as follows:
  - Remove S3 and wiring, Remove relays
  - Rewire LED's to make them work (DSS-24 Only)
- A new TSSA will be made for DSS-24 and the other TSSA will be modified in the field.
  - TSSA removed from DSS-24 will be used DSS-34, the one removed form DSS-34 will be used at DSS-54

TSSA - Existing Design



TSSA - New Design



Phase 1 Development and Deployment Plan

- ECR 01.0040 *Upgrade Antennas to ILA/CJB Hardware*
  - ECR 01.0040 was approved by the CCB on November 9, 2001.
  - The following 820-061 ECO Modkits will be delivered by this Work Unit
    - 110.101 Configuration Control Group (CCG) Hardware
    - 110.102 Microwave Generic Controller (UGC) Software
    - 110.104 Microwave Programmable Logic Controller (PLC) Firmware
    - 110.105 Microwave Generic Controller (UGC) Tables
    - 110.403 34m BWG Feed Equipment Group (FEG)
  - The H/W spares will be delivered as a MESkit (Maintenance and Test Equipment and Spares Kit) per the 813-125 document.
- Deliverable Hardware per Antenna
  - Interlock Logic Assembly (ILA)
    - One per station
    - No spares (each Complex already has two (2) spare units)
  - 28-Volt Command J-Box Assemblies (28-V CJB)
    - Three per station
    - One spare unit each for DSS-34 and -54

Phase 1 Development and Deployment Plan (continued)

- Deliverable Hardware Per Antenna (continued)
  - Computer
    - One Pentium PC for SPC
      - Dual Boot Operating Systems (Windows and OS/2)
    - One Spare Pentium PC
      - To be used as the Complex spare
      - UGC and PLC programs will be configured for all Complex antennas
  - Other H/W
    - S-band & X-band TSSA
    - Fiber Optic Converter Assembly
    - UWV/ANT Interface Assembly
- Deliverable Software per Antenna
  - Microwave Generic Controller (UGC) executable version **3.0.6** and Tables version 3.23 or higher
    - Install at DSS-24, -34, -54 and 34-m HEF Antennas
  - *RSLogix 500* PLC Ladder Logic Program
    - Install at DSS-24, -34, -54, 34-m HEF Antennas and DSS-43.

Assumptions/Considerations

- All existing BWG interlocks will be monitored as is done at DSS-25 and 26.
- New Shroud Hatch will be monitored by the ILA
  - Separate ECR will install the Shroud Hatch at all BWG antennas
- The *20-kW X-band BWG Transmitter Upgrade Task* will be supported.
  - Phase 1 will be installed prior to 20-kW X-band BWG TXR implementation
- The *BWG Ka-Band Upgrade Task* will be taken into account
  - Box locations and Switch counts are being planned to minimize impact to that task
- ANT/ETX Elevation Status Interface
  - Will not be disturbed until the *Ulysses Elevation Interlock Override* is permanently removed from DSS-24, -34 and -54. Then the interface will be implemented as is done at DSS-25 and -26.

Tests Conducted at DSS-24 and JPL

- DSS-24
  - On 6/11/01 an ILA and CJB were taken to DSS-24 to test the ability to monitor/control 28-volt S-band switches.
    - Tests were successful. All S-Band and X-band switches were moved including the S-band Polarizer.
  - SPC to DSS-24 Communications Tests not complete yet - tests scheduled for 11/14/01.
- JPL
  - All 28-V CJBs have successfully monitored/controlled real S- and X-Band waveguide switches in the CCG Test Lab.
  - Individual unit tests for DSS-24 deliverable ILA/CJB assemblies have been successfully completed.
- Other
  - 28-V CJBs have been installed at DSS-25 and -26 since October 2000
  - No failures have been reported from these stations

Test Plan Outline

- Individual Unit Tests for DSS-24, -34, -54
  - Document HTP-517703 will be used for the unit tests and records kept as Volume 3.
  - Test Tools
    - Existing BWG Antenna Simulator
      - simulates ANT equipment
    - Existing Transmitter Simulators (6)
      - simulates TXR equipment
    - Real Waveguide Switches
      - use X-band and S-band waveguide and coaxial switches
    - Closures
- ILA and CJB Integrated Tests
  - Switch monitor/control
  - Antenna Interfaces
  - Transmitter Interfaces

Test Plan Outline (continued)

- Integrated Hardware and Software Test at **JPL** using all of the following
  - Software Test Procedure (STP-1/2) Document
  - Deliverable CCG assemblies
  - Deliverable Cables
  - BWG ANT Simulator
  - TXR Simulators
  - Real waveguide switches
  - Deliverable Computers
  - Deliverable PLC Ladder Logic program
  - Deliverable UGC Tables
- Testing will include CDEs and OE

Test Plan Outline (continued)

- Integrated Hardware and Software Test at **DTF-21** using all of the following
  - Software Test Procedure (STP-1/2) Document
  - Deliverable CCG assemblies
  - Deliverable Cables
  - BWG ANT Simulator
  - TXR Simulators
  - Real waveguide switches
  - Deliverable Computers
  - Deliverable PLC Ladder Logic program
  - Deliverable UGC Tables
  - NMC
- Testing will include the CDEs and OE

On-site Installation and Testing

- Install Hardware (per HWP Document)
  - ILA and CJB assemblies
  - CCG Interconnect Cables
  - CCG cabinet with computers
- Engineering tests
  - From the pedestal using maintenance laptop computer
  - From SPC using Operational Pentium PC
    - Modify/Correct PLC Ladder Logic Program or UGC Tables **as necessary**
- Pre-acceptance tests using STP-1/2 document from NMC
  - Modify/Correct PLC Ladder Logic Program or UGC Tables **as necessary**
- Have TRR for S/W Modkits
- Install SPMC released Software in Operational Pentium PC
- Acceptance Test using STP-1/2 document from NMC
- Deliver Software ECO Modkits

Downtime Schedule Outline

- Seven (7) Continuous Days of Downtime
  - Note
    - station needs to be off-line for 24 hours a day during downtime. This schedule is based on 8 to12 hours per work day.
  - Day 1
    - Correct the X-band Polarizer Drive assembly (DSS-24 Only)
      - re-install correctly per the assembly drawings
    - Remove SIM and UIA equipment and cables from the Pedestal
  - Day 2
    - Install new Computer in CCG cabinet
    - Install new ILA/CJB Hardware in the Pedestal
    - Install new CCG Interconnect Cables
    - Update/Modify TSSA Assemblies

Downtime Schedule Outline (continued)

- Day 3
  - Complete hardware installation
  - SPC to Pedestal Communications equipment connected
  - Turn on equipment
- Day 4
  - Engineering tests with CDE, OE and Station Personnel
- Day 5
  - Pre-Acceptance Test with CDE, OE and Station Personnel
- Day 6
  - Acceptance Test with CDE, OE and Station Personnel
- Day 7
  - DDR Meeting
  - Operations Training
  - OE places S/W in Soak

Operations & Maintenance Training

- Operations Training will be done during the Downtime Period
  - ODs, Displays
- Maintenance Training (5 days)
  - Maintenance Training to be conducted immediately before installation downtime period.
  - 28-volt CJB Assembly Maintenance Training **(new)**
  - ILA/CJB Schematics and Wiring drawings
  - Lessons Learned during CCG Operations Lifetime
  - Windows-based Rockwell Software Training **(new)**
    - *RSNetWorx*
    - *RSLogix 500*
    - *RSLinx*
  - ILA 1747-SDN Scanners **(new)**
    - Flash Update

Sparing Philosophy

- Per document 813-125 a Maintenance and Sparing Agreement (MSA) will be agreed upon by CDE and OE
- Proposed sparing for each complex
  - Spare 28-V CJB
    - one each for CDSCC and MDSCC
    - GDSCC already has a spare 28-V CJB
- Spare Pentium PC Computer
  - One each per Complex
- Spare piece parts
  - 5-volt Power Supplies
  - Input and Output Opto-22 modules
  - Allen-Bradley modules
  - ONEAC Power Supply

Preliminary Maintenance and Sparing Agreement (MSA)

Part	Part number	Supplier	Complex	Net	Assy	Repair mode	MTBF [hours]
Opto-22 module	G4IDC5	Opto-22	0	10	CJB	Replace	400,000
Opto-22 module	G4ODC5	Opto-22	0	10	CJB	Replace	400,000
Opto-22 module	B1 brain board	Opto-22	1	0	ILA/CJB	Replace	400,000
ONEAC power supply	Power supply	ONEAC	0	3	ILA	Replace	500,000
CJB	9612215	JPL	1	0	CJB	CMF	100,000
UGC computer	Assembly	ICS	1	0	Control Cabinet	CMF	100,000
Allen Bradley Flex Input module	1794-IB16	Allen-Bradley	0	3	CJB	Replace	18,000,000
Allen Bradley Flex output module	1794-OW8	Allen-Bradley	0	3	CJB	Replace	3,454,355
Allen Bradley Flex scanner module	1794-ADN	Allen-Bradley	0	3	CJB	Replace	1,555,091
Allen Bradley Relay	700-Ha33z24	Allen-Bradley	1	0	ILA/CJB	Replace	2,000,000
28-volt power supply	9613093-1	Astec	0	1	CJB	Replace	500,000
5-volt power supply	LRS-49-5	Lambda	0	1	ILA/CJB	CMF	400,000

Phase 1 Implementation Concerns

- Scheduling downtime
  - ULYSSES project may prevent installation as planned at DSS-24.
  - Requests have been made for 7-days of downtime at DSS-24, -34 and -54 to the Resource Allocation Planning & Scheduling Office (RAPSO) and Ken Kimball
    - DSS-24 Old: 01/31/2002 - 02/08/2002 **New: 03/15/2002 - 03/22/2002**
    - DSS-34 Old: 04/24/2002 - 05/02/2002 **New: 05/15/2002 - 05/22/2002**
    - DSS-54 Old: 06/19/2002 - 06/27/2002 **New: 07/15/2002 - 07/22/2002**
- GDSCC Station support during DSS-34 downtime
- DSS-24 Communications Tests Pending Nov 14

THESE DATES ARE NO LONGER VALID (SEE BACKUP SLIDES)

Phase 1 Implementation Planned Schedule

ID	Task Name	Duration	Start	Finish
1	**1 CCG DSN Unification Task Phase 1: ILA, CJB Upgrade at DSS-24, -34, -54**	**249 days**	**Mon 10/1/01**	**Mon 9/30/02**
2	**1.1 FY '02 Quarter #1**	**61 days**	**Mon 10/1/01**	**Fri 12/28/01**
3	1.1.1 Quarter Timescale	61 days	Mon 10/1/01	Fri 12/28/01
4	**1.1.2 Labor Costs**	**60 days**	**Mon 10/1/01**	**Thu 12/27/01**
5	1.1.2.1 ILA and CJBs for DSS-24 are available, Complete Unit Test of each.	0 days	Mon 10/1/01	Mon 10/1/01
6	1.1.2.2 Draft Engineering Change Request (ECR) and submit to CCB for approval.	1 day	Mon 10/1/01	Mon 10/1/01
7	1.1.2.3 Prepare Phase 1 Peer Review Material	6 days	Tue 10/30/01	Fri 11/9/01
8	1.1.2.4 Phase 1 Peer Review	1 day	Mon 11/12/01	Mon 11/12/01
9	1.1.2.5 Request DSS-24,-34,-54 downtime from RAP board	9 days	Tue 10/30/01	Fri 11/9/01
10	**1.1.2.6 DSS-24**	**60 days**	**Mon 10/1/01**	**Thu 12/27/01**
11	**1.1.2.6.1 DSS-24 Drawing/Documentation Changes**	**25 days**	**Tue 11/13/01**	**Wed 12/19/01**
17	**1.1.2.6.2 DSS-24 S/W Changes**	**60 days**	**Mon 10/1/01**	**Thu 12/27/01**
24	**1.1.3 H/W Procurement**	**30 days**	**Tue 11/13/01**	**Fri 12/28/01**
25	1.1.3.1 DSS-24, -34 & -54 Cable Procurement & DSS-24 Fabrication	30 days	Tue 11/13/01	Fri 12/28/01
26	1.1.3.2 Place DSS-34 & -54 Hardware Procurement Orders	30 days	Tue 11/13/01	Fri 12/28/01
27	**1.2 FY '02 Quarter #2**	**61 days**	**Wed 1/2/02**	**Fri 3/29/02**
28	1.2.1 Quarter Timescale	61 days	Wed 1/2/02	Fri 3/29/02
29	**1.2.2 Labor Costs**	**60 days**	**Wed 1/2/02**	**Thu 3/28/02**
30	**1.2.2.1 DSS-24**	**27 days**	**Wed 1/2/02**	**Fri 2/8/02**
46	**1.2.2.2 DSS-34**	**60 days**	**Wed 1/2/02**	**Thu 3/28/02**
69	**1.2.2.3 DSS-54**	**55 days**	**Wed 1/2/02**	**Thu 3/21/02**
88	**1.3 FY '02 Quarter #3**	**64 days**	**Mon 4/1/02**	**Fri 6/28/02**
89	1.3.1 Quarter Timescale	64 days	Mon 4/1/02	Fri 6/28/02
90	**1.3.2 Labor Costs**	**63 days**	**Mon 4/1/02**	**Thu 6/27/02**
91	**1.3.2.1 DSS-34**	**24 days**	**Mon 4/1/02**	**Thu 5/2/02**
104	**1.3.2.2 DSS-54**	**63 days**	**Mon 4/1/02**	**Thu 6/27/02**
121	**1.4 FY'02 Quarter #4**	**63 days**	**Mon 7/1/02**	**Mon 9/30/02**
122	1.4.1 Quarter Timescale	63 days	Mon 7/1/02	Mon 9/30/02
123	**1.4.2 Labor Costs**	**63 days**	**Mon 7/1/02**	**Mon 9/30/02**

THIS SCHEDULE IS NO LONGER VALID
(SEE BACKUP SLIDES)

Phase 1 Implementation Cost Estimate

FY 2002	Estimated Cost [$K]
Labor Costs	$140
Hardware Costs	$50
Total [$K]	**$190**

THIS COST ESTIMATE IS NO LONGER VALID (SEE BACKUP SLIDES)

BACK UP MATERIAL

Activities Since 11/12/2001

- The Phase 1 Cost Estimate was recalculated using the latest available JPL & MTC labor rates & H/W component vendor quotes.
  - The cost of the Phase 1 implementation increased.
- Three (3) Options were examined looking for the best one that would fit TMOD's budget profile for Fiscal 2002.
  - First Option (DSS-24, -34 & -54 Only)
    - Procure H/W in FY 02, Implement DSS-24 & -54 in FY 02, Implement DSS-34 in FY 03.
  - *Second Option (DSS-24, **-27**, -34 & -54)*
    - *Procure H/W in FY 02, Implement DSS-24 & -54 in FY 02, Implement **DSS-27** & -34 in FY 03.*
  - Third Option (DSS-24, **-27**, -34 & -54)
    - Procure H/W in FY 02, Implement DSS-24, **-27** & -54 in FY 02, Implement DSS-34 in FY 03.

Activities Since 11/12/2001 (continued)

		FY '02 [$K]	FY '03 [$K]	Total [$K]
First Option	Burdened Sub-Total [$K]	$210.90	$71.71	$282.60
Second Option	Burdened Sub-Total [$K]	$229.23	$128.68	$357.91
Third Option	Burdened Sub-Total [$K]	$286.21	$71.71	$357.91
	Inflation Rate	1.00	1.05	
First Option	Burd. & Inflated Total [$K]	$210.90	$75.29	$286.19
Second Option	Burd. & Inflated Total [$K]	$229.23	$135.12	$364.35
Third Option	Burd. & Inflated Total [$K]	$286.21	$75.29	$361.50

- The burdened & inflated cost estimates for the 3 options are presented above.
- **The Second Option was selected as the best candidate that fits the Budget Profile.**
  - Notice that this Option also includes DSS-27

Phase 1 Cost Estimate: Second Option Details

Second Option: FY '02 (DSS-24 & -54), FY '03 (DSS-34 & -27)		FY '02 [$K]	FY '03 [$K]	Total [$K]
H/W Procurements Sub-Total [$K]		$73.76	$17.64	$91.40
	Procurement-PO Burden	1.18	1.18	
H/W Procurements Burdened Sub-Total [$K]		$87.19	$20.85	$108.04
MTC Procurement Sub-Total [$K]		$42.28	$49.40	$91.68
	PS - Res. & Dev. Burden	1.09	1.09	
MTC Procurement Burdened Sub-Total [$K]		$46.17	$53.95	$100.12
JPL Labor				
CCG H/W CDE	WY	0.13	0.11	0.24
FY '02: 264.8 hours, FY '03: 212.8 hours	[$K]	$27.01	$21.71	$48.72
	CCG H/W CDE Burden Factor	1.08	1.08	
CCG H/W CDE Burdened Sub-Total [$K]		$29.19	$23.46	$52.66
CCG S/W CDE	WY	0.16	0.16	0.32
FY '02: 320 hours, FY '03: 320 hours	[$K]	$29.12	$29.12	$58.24
	CCG S/W CDE Burden Factor	1.01	1.01	
CCG S/W CDE Burdened Sub-Total [$K]		$29.36	$29.36	$58.72
JPL Labor Burdened Sub-Total [$K]		$58.55	$52.82	$111.38
JPL Travel [$K]		$3.00	$1.00	$4.00
	TR-Prog. Dom. Burden Factor	1.06	1.06	
JPL Travel Burdened Sub-Total [$K]		$3.19	$1.06	$4.25

FY '02 YTD Labor Obligations (Phase 1 White Paper, Peer Review & WA Preparation)		
MTC Labor Burdened Sub-Total [$K]	$19K*(21.84/20), Burn Report 11/25/01	$20.75
JPL Labor Burdened Sub-Total [$K]	MSE & JK Data Extractor	$13.38
	Sub-Total [$K]	$34.12

	FY '02 [$K]	FY '03 [$K]	Total [$K]
Burdened Sub-Total [$K]	$229.23	$128.68	$357.91
Inflation Rate	1.00	1.05	
Burdened Total [$K]	$229.23	$135.12	$364.35

Phase 1 Second Option

- Before submitting the Cost Estimate for the Phase 1 Second Option to TMOD the numbers on slide 38 were analyzed by the *Oracle Applications Budgeting Tool.*
  - Purpose
    - Obtain accurate burdened & inflated cost and encumbrance amounts for the CCG DSN Unification Phase 1 Task (Second Option) Cost Estimate for Section Management & Group Supervisors examination.
  - Notes
    - The Cost Estimates were ready in early December 2001 but the *Oracle Applications Budgeting Tool* was taken off-line until January 2002.
    - The JPL Account Code provided by TMOD for this Task is 100712-51.101.00.3.8471.
  - Costs
    - **FY 2002 - $237.84K, FY 2003 - $142.06K, Total: $379.90K**
      - The additional $15K is due to the Line MGR Labor FTE not included in the cost estimate of Slide 38.

Phase 1 Second Option - Oracle Applications Budgeting Tool Output

Oracle Applications - PROD (11i) cloned from PRODAPP on 14-DEC-2001

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Budgeting Tool - Budget Lines

Project #	100712	Task #	51.101.00.3.8471	Task Mgr.	ESQUIVEL, MANUEL S
Budget Type	Playground 3	Task Name	CCG UNIFIC. PHASE 1	Task Org.	3330 - COMMUNICATIONS GROUND SYSTE

Starting Year: 2002 | Budget Lines Year | FTE | 2002 | Apply Rates | Apply Actuals | Report

Cost Resource	99-01	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total Years
CB-DESKTOP NETWORK SERVICES	0.00	1.62	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.95
CB-FILE SERVICE	0.00	0.27	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49
CB-MESSAGING	0.00	0.19	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35
CB-NETWORK SERVICES	0.00	0.18	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33
CB-TELEPHONE CHARGES	0.00	0.27	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49
LJ-ENGINEERING-SENIOR	0.00	0.17	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29
LJ-IS&CS-ASSOC	0.00	0.20	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38
LJ-LINE MGR-MGR I	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
LJ-LINE MGR-MGR I PRIN	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
PROCUREMENT-PO	0.00	58.76	17.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	76.40
PS-RESEARCH & DEVELOPMENT	0.00	80.58	49.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	129.98
TR-PROGRAMMATIC DOMESTIC	0.00	3.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00
Total Direct Cost (Raw, Fringes, MPS)	0.00	198.42	115.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	313.97
Total ADC Cost (Labor, Procurement, Gen.)	0.00	39.42	26.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.93
Total Burdened Cost	0.00	237.84	142.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	379.90
Total Burdened Obligation	0.00	237.84	142.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	379.90
Encumbrance Amount												
Total Encumbrance Amount	0.00	139.34	67.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	206.38

NEW SLIDE

Phase 1 Second Option - Oracle Budgeting Tool Output FY 2002

Oracle Applications - PROD (11i) cloned from PRODAPP on 14-DEC-2001

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Budgeting Tool - Budget Lines

Project # 100712 | Task # 51.101.00.3.8471 | Task Mgr. ESQUIVEL, MANUEL S
Budget Type Playground 3 | Task Name CCG UNIFIC. PHASE 1 | Task Org. 3330 - COMMUNICATIONS GROUND SYSTE

Starting Year: 2002 | Budget Lines Month | FTE | 2002 | Apply Rates | Apply Actuals | Report

Cost Resource	Prior Yr	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year Total	[ ]
CB-DESKTOP NETWORK SERVICES	0.00	0.12	0.12	0.16	0.12	0.12	0.16	0.12	0.12	0.16	0.12	0.12	0.16	1.62	
CB-FILE SERVICE	0.00	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.27	
CB-MESSAGING	0.00	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.19	
CB-NETWORK SERVICES	0.00	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.18	
CB-TELEPHONE CHARGES	0.00	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.27	
LJ-ENGINEERING-SENIOR	0.00	0.11	0.28	0.36	0.18	0.16	0.12	0.16	0.15	0.13	0.17	0.14	0.12	0.17	*
LJ-IS&CS-ASSOC	0.00	0.54	0.23	0.43	0.00	0.16	0.12	0.15	0.15	0.13	0.17	0.16	0.13	0.20	*
LJ-LINE MGR-MGR I	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
LJ-LINE MGR-MGR I PRIN	0.00	0.00	0.05	0.02	0.03	0.03	0.02	0.03	0.03	0.02	0.03	0.03	0.02	0.03	
PROCUREMENT-PO	0.00	0.00	12.92	0.00	10.00	10.00	10.00	10.00	0.00	0.00	0.00	5.84	0.00	58.76	
PS-RESEARCH & DEVELOPMENT	0.00	0.00	0.00	0.00	25.95	0.00	15.00	0.00	1.88	0.00	20.75	0.00	17.00	80.58	
TR-PROGRAMMATIC DOMESTIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	3.00	
	0.00													0.00	
Total Direct Cost (Raw, Fringes, MPS)	0.00	6.04	18.61	8.88	38.78	14.05	29.29	14.07	8.96	4.24	24.77	9.71	21.04	198.44	
Total ADC Cost (Labor, Procurement, Gen.)	0.00	2.62	4.45	3.52	5.11	3.31	4.76	3.32	1.86	1.54	3.39	2.49	3.03	39.40	
Total Burdened Cost	0.00	8.66	23.06	12.40	43.89	17.36	34.04	17.39	10.82	5.78	28.16	12.20	24.08	237.84	
Total Burdened Obligation	0.00	8.66	23.06	100.39	15.55	17.36	17.66	17.39	8.76	5.78	5.51	12.20	5.51	237.84	
Encumbrance Amount														0.00	
Total Encumbrance Amount	0.00	0.00	12.92	80.57	10.00	10.00	10.00	10.00	0.00	0.00	0.01	5.84	0.00	139.34	
Comments															

NEW SLIDE

Phase 1 Second Option - Oracle Budgeting Tool Output FY 2003

Oracle Applications - PROD (11i) cloned from PRODAPP on 14-DEC-2001

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Budgeting Tool - Budget Lines

Project #	100712	Task #	51.101.00.3.8471	Task Mgr.	ESQUIVEL, MANUEL S
Budget Type	Playground 3	Task Name	CCG UNIFIC. PHASE 1	Task Org.	3330 - COMMUNICATIONS GROUND SYSTE

Starting Year: 2002 | Budget Lines Month | FTE | 2003 | Apply Rates | Apply Actuals | Report

Cost Resource	Prior Yr	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year Total	[ ]
CB-DESKTOP NETWORK SERVICES	1.62	0.10	0.10	0.13	0.10	0.10	0.13	0.10	0.10	0.13	0.10	0.13	0.10	1.33	
CB-FILE SERVICE	0.27	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.22	
CB-MESSAGING	0.19	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.16	
CB-NETWORK SERVICES	0.18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15	
CB-TELEPHONE CHARGES	0.27	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.22	
LJ-ENGINEERING-SENIOR	0.17	0.11	0.11	0.15	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	*
LJ-IS&CS-ASSOC	0.20	0.17	0.17	0.23	0.19	0.18	0.17	0.17	0.17	0.18	0.19	0.18	0.19	0.18	*
LJ-LINE MGR-MGR I	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
LJ-LINE MGR-MGR I PRIN	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	
PROCUREMENT-PO	58.76	1.36	1.36	1.70	1.36	1.36	1.70	1.36	1.36	1.70	1.36	1.70	1.36	17.64	
PS-RESEARCH & DEVELOPMENT	80.58	0.00	0.00	0.00	28.30	0.00	0.00	10.30	0.00	0.00	0.00	10.80	0.00	49.40	
TR-PROGRAMMATIC DOMESTIC	3.00	0.08	0.08	0.10	0.08	0.08	0.10	0.08	0.08	0.10	0.08	0.10	0.08	1.00	
	80.58													0.00	
Total Direct Cost (Raw, Fringes, MPS)	198.44	5.12	5.12	6.20	33.36	5.10	6.42	15.42	5.13	6.37	5.07	17.17	5.07	115.55	
Total ADC Cost (Labor, Procurement, Gen.)	39.40	1.69	1.69	2.05	4.34	1.68	2.12	2.66	1.69	2.10	1.67	3.12	1.68	26.49	
Total Burdened Cost	237.84	6.81	6.81	8.25	37.70	6.78	8.54	18.09	6.83	8.47	6.75	20.30	6.75	142.08	
Total Burdened Obligation	237.83	6.81	6.81	62.30	6.73	6.80	8.54	6.81	6.83	8.47	6.75	8.48	6.75	142.08	
Encumbrance Amount														0.00	
Total Encumbrance Amount	139.34	1.36	1.36	51.09	1.36	1.38	1.70	1.36	1.36	1.70	1.36	1.70	1.36	67.08	
Comments															

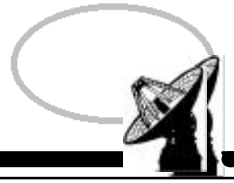
NEW SLIDE

Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish
1	**1 CCG DSN Unification Task Phase 1**	**398 days**	**Mon 10/1/01**	**Tue 5/6/03**
2	*1.1 FY '02: Procure all ILA & CJB H/W, Implement DSS-24 & -54*	*0 days*	*Mon 10/1/01*	*Mon 10/1/01*
3	*1.2 FY '03: Procure FOCA & ANT/UWV Interface Assy, Implement D*	*0 days*	*Tue 10/1/02*	*Tue 10/1/02*
4	*1.3 This is Phase One (1) Option #2: DSS-24, -27, -34 & -54*	*0 days*	*Thu 11/29/01*	*Thu 11/29/0*
5				
6	**1.4 FY '02 Work**	**209.33 days**	**Mon 10/1/01**	**n 8/ 2**
7				
8	**1.4.1 FY '02 YTD Obligations**	**48 days**	**M 10/1/01**	**F 01**
9	1.4.1.1 White Paper Preparation	20 days	M 10/1/01	Fri 10/26/01
10	1.4.1.2 DSS-24 UGC Tables Programming	4 days	M 10/ 1	Fri 11/30/01
11	**1.4.1.3 Peer Review**	**11 on**	**29/01**	**Mon 11/12/01**
12	1.4.1.3.1 Preparation	10 days	on 10/29/01	Fri 11/9/01
13	1.4.1.3.2 Peer Review	1 day	Mon 11/12/01	Mon 11/12/01
14	**1.4.1.4 WA Preparation**	**17 days**	**Tue 11/13/01**	**Fri 12/7/01**
15	1.4.1.4.1 WA Drafting	10 days	Tue 11/13/01	Wed 11/28/01
16	1.4.1.4.2 Section Management Review	2 days	Thu 11/29/01	Fri 11/30/01
17	1.4.1.4.3 TMOD Approves - e 1 - F Funding A	5 days	Mon 12/3/01	Fri 12/7/01
18				
19	**1.4.2 Rest of FY '02 Work**	**161.33 days**	**Mon 12/10/01**	**Mon 8/5/02**
20				
21	**1.4.2.1 H/W Procurement for DSS-24, -34, -54 & -27 Ant**	**40 days**	**Mon 12/10/01**	**Fri 2/8/02**
22	1.4.2.1.1 ILA Components	25 days	Mon 12/10/01	Thu 1/17/02
23	1.4.2.1.2 CJB Components	25 days	Mon 12/10/01	Thu 1/17/02
24	1.4.2.1.3 Fiber Optic Converter Assy Components	25 days	Mon 12/10/01	Thu 1/17/02
25	1.4.2.1.4 ANT/UWV Interface Assy	25 days	Mon 12/10/01	Thu 1/17/02
26	1.4.2.1.5 CCG Interconnect Cable Materials (DSS-24	25 days	Mon 12/10/01	Thu 1/17/02

Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish
27	**1.4.2.1.6 Computer Procurement for for DSS-24, &**	**40 days**	**Mon 12/10/01**	**Fri 2/8/02**
28	1.4.2.1.6.1 DSS-24	20 days	Mon 12/10/01	Thu 1/10/02
29	1.4.2.1.6.2 DSS-54	20 days	Fri 1/11/02	Fri 2/8/02
30	***1.4.2.1.7 H/W Procurement Burden***	***0 days***	***Fri 2/8/02***	***Fri 2/8/***
31				
32	**1.4.2.2 H/W Assembly**	**34.33 days**	**Thu 1/17/02**	**Mon 1/0**
33	**1.4.2.2.1 ILA Assembly**	**6 days**	**Thu 1/** **02**	**on 1 /02**
34	1.4.2.2.1.1 DSS-54	6 days	Thu 1/1 02	on 28/02
35	**1.4.2.2.2 CJB Assembly**	**8 days**	**Fri 1/18**	**ed 1/30/02**
36	**1.4.2.2.2.1 DSS-54**	**da s**	**Fri 1/ 8/**	**Wed 1/30/02**
37	1.4.2.2.2.1.1 CJB #1		/18/02	Thu 1/24/02
38	1.4.2.2.2.1.2 CJB #2	4 days	Fri 1/18/02	Thu 1/24/02
39	1.4.2.2.2.1.3 CJB #3	days	Fri 1/25/02	Wed 1/30/02
40	**1.4.2.2.3 Fiber Optic Converter Ass sse bl**	**1.33 days**	**Fri 1/25/02**	**Mon 1/28/02**
41	1.4.2.2.3.1 DSS-54	10.67 hrs	Fri 1/25/02	Mon 1/28/02
42	**1.4.2.2.4 ANT/UWV Interfac Ass**	**1.33 days**	**Thu 1/31/02**	**Fri 2/1/02**
43	1.4.2.2.4.1 DSS-	10.67 hrs	Thu 1/31/02	Fri 2/1/02
44	**1.4.2.2.5 CCG Interco nect ble Assembly**	**25 days**	**Fri 2/1/02**	**Mon 3/11/02**
45	1.4.2.2.5.1 DSS-24	4 days	Fri 2/1/02	Thu 2/7/02
46	1.4.2.2.5.2 DSS-54	74.67 hrs	Tue 2/26/02	Mon 3/11/02
47	***1.4.2.2.6 MTC Labor Burden***	***0 days***	***Mon 3/11/02***	***Mon 3/11/02***
48				
49	**1.4.2.3 H/W Unit Test**	**10 days**	**Mon 1/28/02**	**Mon 2/11/02**
50	**1.4.2.3.1 ILA Assembly**	**2.5 days**	**Mon 1/28/02**	**Thu 1/31/02**
51	1.4.2.3.1.1 DSS-54	2.5 days	Mon 1/28/02	Thu 1/31/02
52	**1.4.2.3.2 CJB Assembly**	**7.5 days**	**Thu 1/31/02**	**Mon 2/11/02**
53	**1.4.2.3.2.1 DSS-54**	**7.5 days**	**Thu 1/31/02**	**Mon 2/11/02**



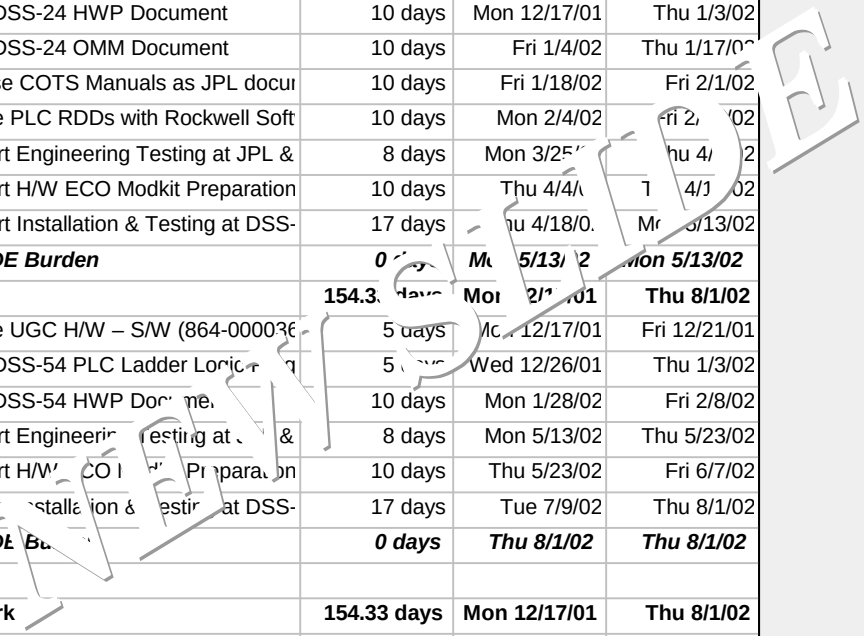
Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish
54	1.4.2.3.2.1.1 CJB #1	2.5 days	Thu 1/31/02	Mon 2/4/02
55	1.4.2.3.2.1.2 CJB #2	2.5 days	Tue 2/5/02	Thu 2/7/02
56	1.4.2.3.2.1.3 CJB #3	2.5 days	Thu 2/7/02	Mon 2/11/02
57	***1.4.2.3.3 MTC Labor Burden***	***0 days***	***Mon 2/11/02***	***Mon 2/11/***
58				
59	**1.4.2.4 Drawings**	**50 days**	**Mon 12/10/01**	**Mon 2/5/02**
60	**1.4.2.4.1 DSS-24**	**25 days**	**Mon 12/1 01**	**Thu 1 /02**
61	1.4.2.4.1.1 9603724, DSS-24 UWV S/S	5 days	Mon 12/1 01	Fri 1 14/01
62	1.4.2.4.1.2 9499218, DSS-24 S- and X-Band Fee	5 days	on 12/17	12/21/01
63	1.4.2.4.1.3 9499219, DSS-24 Functional Block Di	days	d 12	Thu 1/3/02
64	1.4.2.4.1.4 9499220, DSS-24 UWV Cable Packa		1/4/02	Thu 1/10/02
65	1.4.2.4.1.5 9616485, DSS-24 CCG Interconn ct	5 days	Fri 1/11/02	Thu 1/17/02
66	**1.4.2.4.2 DSS-54**	**25 days**	**Fri 1/18/02**	**Mon 2/25/02**
67	1.4.2.4.2.1 9611310, DSS-54 UW S/S	5 days	Fri 1/18/02	Fri 1/25/02
68	1.4.2.4.2.2 9611311, DSS- a d X-Ba Fee	5 days	Mon 1/28/02	Fri 2/1/02
69	1.4.2.4.2.3 9611314, D S-54 v Ca le Packa	5 days	Mon 2/4/02	Fri 2/8/02
70	1.4.2.4.2.4 961 DSS 54 F ct nal Block Di	5 days	Mon 2/11/02	Fri 2/15/02
71	1.4.2.4.2.5 961648 , D 4 CCG Interconnect I	5 days	Tue 2/19/02	Mon 2/25/02
72	***1.4.2.4.3 MTC Labor Bu den***	***0 days***	***Mon 2/25/02***	***Mon 2/25/02***
73				
74	**1.4.2.5 Integrated Testing of CCG H/W Assemblies**	**10 days**	**Mon 3/11/02**	**Mon 3/25/02**
75	1.4.2.5.1 DSS-24 CCG H/W	5 days	Mon 3/11/02	Mon 3/18/02
76	1.4.2.5.2 DSS-54 CCG H/W	5 days	Mon 3/18/02	Mon 3/25/02
77	***1.4.2.5.3 MTC Labor Burden***	***0 days***	***Mon 3/25/02***	***Mon 3/25/02***
78				
79	**1.4.2.6 CCG H/W CDE Work**	**159.33 days**	**Mon 12/10/01**	**Thu 8/1/02**
80	**1.4.2.6.1 DSS-24**	**104.33 days**	**Mon 12/10/01**	**Mon 5/13/02**

15			Tue Jan 16		
6 AM	12 PM	6 PM	12 AM	6 AM	12 PM

Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish
81	1.4.2.6.1.1 Update UGC H/W – S/W (864-000036	5 days	Mon 12/10/01	Fri 12/14/01
82	1.4.2.6.1.2 Write DSS-24 PLC Ladder Logic Prog	5 days	Mon 12/17/01	Fri 12/21/01
83	1.4.2.6.1.3 Write DSS-24 HWP Document	10 days	Mon 12/17/01	Thu 1/3/02
84	1.4.2.6.1.4 Write DSS-24 OMM Document	10 days	Fri 1/4/02	Thu 1/17/02
85	1.4.2.6.1.5 Release COTS Manuals as JPL docu	10 days	Fri 1/18/02	Fri 2/1/02
86	1.4.2.6.1.6 Update PLC RDDs with Rockwell Soft	10 days	Mon 2/4/02	Fri 2/ /02
87	1.4.2.6.1.7 Support Engineering Testing at JPL &	8 days	Mon 3/25/	hu 4/ 2
88	1.4.2.6.1.8 Support H/W ECO Modkit Preparation	10 days	Thu 4/4/	4/1 02
89	1.4.2.6.1.9 Support Installation & Testing at DSS-	17 days	u 4/18/0.	M /13/02
90	***1.4.2.6.2 CCG H/W CDE Burden***	***0***	***M 5/13/ 2***	***ion 5/13/02***
91	**1.4.2.6.3 DSS-54**	**154.3 days**	**Mo 2/1 01**	**Thu 8/1/02**
92	1.4.2.6.3.1 Update UGC H/W – S/W (864-000036	5 days	M 12/17/01	Fri 12/21/01
93	1.4.2.6.3.2 Write DSS-54 PLC Ladder Logic	5	Wed 12/26/01	Thu 1/3/02
94	1.4.2.6.3.3 Write DSS-54 HWP Doc me	10 days	Mon 1/28/02	Fri 2/8/02
95	1.4.2.6.3.4 Support Engineeri esting at &	8 days	Mon 5/13/02	Thu 5/23/02
96	1.4.2.6.3.5 Support H/W CO Pr para on	10 days	Thu 5/23/02	Fri 6/7/02
97	1.4.2.6.3.6 Supp stalla ion & esti at DSS-	17 days	Tue 7/9/02	Thu 8/1/02
98	***1.4.2.6.4 CCG H/W CDE Bu***	***0 days***	***Thu 8/1/02***	***Thu 8/1/02***
99				
100	**1.4.2.7 CCG S/W CDE Work**	**154.33 days**	**Mon 12/17/01**	**Thu 8/1/02**
101	**1.4.2.7.1 DSS-24**	**99.33 days**	**Mon 12/17/01**	**Mon 5/13/02**
102	1.4.2.7.1.1 Convert DSS-24 UGC Tables from Du	5 days	Mon 12/17/01	Fri 12/21/01
103	1.4.2.7.1.2 Write DSS-24 STP-1/2 Document	10 days	Wed 12/26/01	Thu 1/10/02
104	1.4.2.7.1.3 Update RDD Documents	5 days	Fri 1/11/02	Thu 1/17/02
105	1.4.2.7.1.4 Update UGC SOM Manual	5 days	Fri 1/18/02	Fri 1/25/02
106	1.4.2.7.1.5 Support Engineering Testing at JPL &	8 days	Mon 3/25/02	Thu 4/4/02
107	1.4.2.7.1.6 Support S/W ECO Modkit Preparation	10 days	Thu 4/4/02	Thu 4/18/02
108	1.4.2.7.1.7 Support Installation & Testing at DSS-	17 days	Thu 4/18/02	Mon 5/13/02



Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish
109	***1.4.2.7.2 CCG S/W CDE Burden***	***0 days***	***Mon 5/13/02***	***Mon 5/13/02***
110	**1.4.2.7.3 DSS-54**	**149.33 days**	**Wed 12/26/01**	**Thu 8/1/02**
111	1.4.2.7.3.1 Convert DSS-54 UGC Tables from Du	5 days	Wed 12/26/01	Thu 1/3/02
112	1.4.2.7.3.2 Write DSS-54 STP-1/2 Document	10 days	Fri 1/4/02	Thu 1/17/0
113	1.4.2.7.3.3 Update RDD Documents	5 days	Fri 1/18/02	Fri 1/25/0
114	1.4.2.7.3.4 Update UGC SOM Manual	5 days	Mon 1/28/02	Fr 1/02
115	1.4.2.7.3.5 Support Engineering Testing at JPL &	8 days	Mon 5/1	hu 5/ /02
116	1.4.2.7.3.6 Support S/W ECO Modkit Preparatior	10 days	Thu 5/2	Fri /02
117	1.4.2.7.3.7 Support Installation & Testing at DSS	17 days	Tue 7/9/	8/1/02
118	***1.4.2.7.4 CCG S/W CDE Burden***	***0***	***hu 8/ /02***	***Thu 8/1/02***
119				
120	**1.4.2.8 Engineering Testing @ JPL & DTF-21**	**43 days**	**M 3/25/02**	**Thu 5/23/02**
121	**1.4.2.8.1 DSS-24**	**8**	**Mon 3/25/02**	**Thu 4/4/02**
122	1.4.2.8.1.1 DSS-24 CCG H/W & S/	5 days	Mon 3/25/02	Mon 4/1/02
123	1.4.2.8.1.2 DSS-24 CCG H/ S/W inte	3 days	Mon 4/1/02	Thu 4/4/02
124	**1.4.2.8.2 DSS-54**	**8 days**	**Mon 5/13/02**	**Thu 5/23/02**
125	1.4.2.8.2.1 DSS- CCG /W & /W egrated t	5 days	Mon 5/13/02	Mon 5/20/02
126	1.4.2.8.2.2 DSS-54 C W & W integrated t	3 days	Mon 5/20/02	Thu 5/23/02
127	***1.4.2.8.3 MTC Labor Burden***	***0 days***	***Thu 5/23/02***	***Thu 5/23/02***
128				
129	**1.4.2.9 ECO Modkit Preparation**	**45 days**	**Thu 4/4/02**	**Fri 6/7/02**
130	**1.4.2.9.1 DSS-24**	**10 days**	**Thu 4/4/02**	**Thu 4/18/02**
131	1.4.2.9.1.1 DSS-24 H/W ECO Modkit Preparatior	10 days	Thu 4/4/02	Thu 4/18/02
132	1.4.2.9.1.2 DSS-24 S/W ECO Modkit Preparatior	10 days	Thu 4/4/02	Thu 4/18/02
133	1.4.2.9.1.3 DSS-24 ECO Modkits Delivered to DL	0 days	Thu 4/18/02	Thu 4/18/02
134	**1.4.2.9.2 DSS-54**	**10 days**	**Thu 5/23/02**	**Fri 6/7/02**
135	1.4.2.9.2.1 DSS-54 H/W ECO Modkit Preparatior	10 days	Thu 5/23/02	Fri 6/7/02
136	1.4.2.9.2.2 DSS-54 S/W ECO Modkit Preparatior	10 days	Thu 5/23/02	Fri 6/7/02

15			Tue Jan 16		
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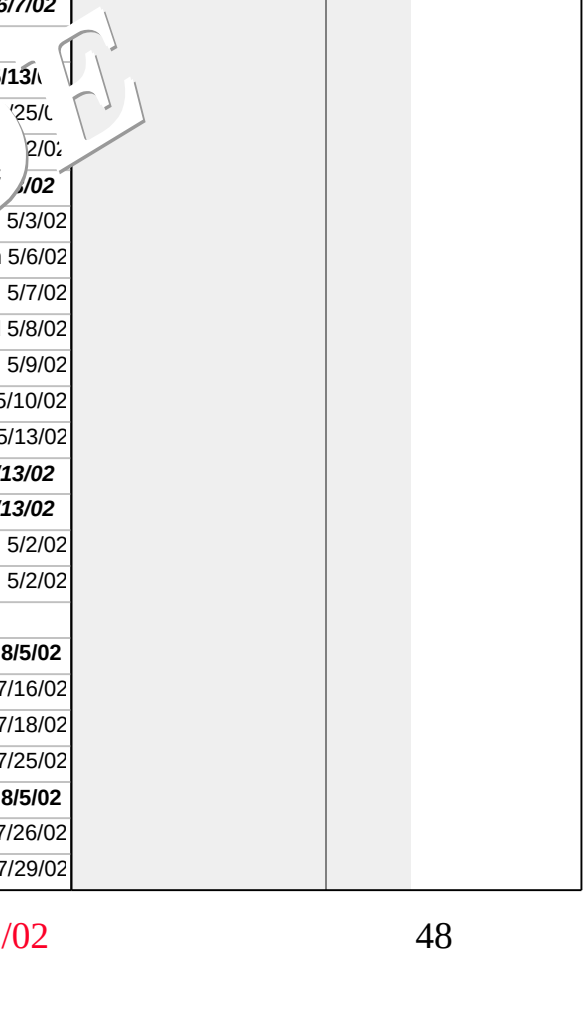
Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish
137	1.4.2.9.2.3 DSS-54 ECO Modkits Delivered to DL	0 days	Fri 6/7/02	Fri 6/7/02
138	***1.4.2.9.3 MTC Labor Burden***	***0 days***	***Fri 6/7/02***	***Fri 6/7/02***
139				
140	**1.4.2.10 DSS-24 Installation, Testing & Training**	**17 days**	**Thu 4/18/02**	**Mon 5/13/**
141	1.4.2.10.1 Schedule and hold DSS-24 Test Readiness	5 days	Thu 4/18/02	Th 25/
142	1.4.2.10.2 Pre-Downtime Testing & Training	5 days	Thu 4/2 02	Thu 2/0
143	***1.4.2.10.3 DSS-24 Downtime Period***	***7 days***	***Thu 5/2 2***	***n 5/ /02***
144	1.4.2.10.3.1 Day 1	1 day	Thu 5/2 2	Fri 5/3/02
145	1.4.2.10.3.2 Day 2	ay	Fri /3/	Mon 5/6/02
146	1.4.2.10.3.3 Day 3	1 day	Mo 6/02	Tue 5/7/02
147	1.4.2.10.3.4 Day 4	1 day	Tue 5/7/02	Wed 5/8/02
148	1.4.2.10.3.5 Day 5	1 d	Wed 5/8/02	Thu 5/9/02
149	1.4.2.10.3.6 Day 6	1 day	Thu 5/9/02	Fri 5/10/02
150	1.4.2.10.3.7 Day 7	1 day	Fri 5/10/02	Mon 5/13/02
151	***1.4.2.10.4 DSS-24 Return o O ors***	***0 days***	***Mon 5/13/02***	***Mon 5/13/02***
152	***1.4.2.10.5 MTC Lab rde***	***0 days***	***Mon 5/13/02***	***Mon 5/13/02***
153	1.4.2.10.6 JPL Travel t D	0 days	Thu 5/2/02	Thu 5/2/02
154	1.4.2.10.7 JPL Travel Bu den	0 days	Thu 5/2/02	Thu 5/2/02
155				
156	**1.4.2.11 DSS-54 Installation, Testing & Training**	**19 days**	**Tue 7/9/02**	**Mon 8/5/02**
157	1.4.2.11.1 Schedule and hold DSS-54 Test Readiness	5 days	Tue 7/9/02	Tue 7/16/02
158	1.4.2.11.2 JPL Personnel Travel to MDSCC	2 days	Tue 7/16/02	Thu 7/18/02
159	1.4.2.11.3 Pre-Downtime Testing & Training	5 days	Thu 7/18/02	Thu 7/25/02
160	**1.4.2.11.4 DSS-54 Downtime Period**	**7 days**	**Thu 7/25/02**	**Mon 8/5/02**
161	1.4.2.11.4.1 Day 1	1 day	Thu 7/25/02	Fri 7/26/02
162	1.4.2.11.4.2 Day 2	1 day	Fri 7/26/02	Mon 7/29/02



Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish
163	1.4.2.11.4.3 Day 3	1 day	Mon 7/29/02	Tue 7/30/02
164	1.4.2.11.4.4 Day 4	1 day	Tue 7/30/02	Wed 7/31/02
165	1.4.2.11.4.5 Day 5	1 day	Wed 7/31/02	Thu 8/1/0
166	1.4.2.11.4.6 Day 6	1 day	Thu 8/1/02	Fri 8/2
167	1.4.2.11.4.7 Day 7	1 day	Fri 8/2/02	8/5/
168	***1.4.2.11.5 DSS-54 Returned to Operations***	***0 days***	***Mon 8/5/***	***Mon /02***
169	***1.4.2.11.6 MTC Labor Burden***	***0 days***	***Mon 8/5 ?***	***on /02***
170				
171				
172	**1.5 FY '03 Work**	**1 9 days**	**e 1 /02**	**Tue 5/6/03**
173	1.5.1 FY '03 Funding Available	days	ue 10/1/02	Tue 10/1/02
174	1.5.2 Time-Lag to get MTC CWOs in Place	2 day	Tue 10/1/02	Mon 10/28/02
175				
176	**1.5.3 H/W Procurements for DSS-27 & -3**	**25 days**	**Tue 10/1/02**	**Mon 11/4/02**
177	1.5.3.1 ILA Components	25 days	Tue 10/1/02	Mon 11/4/02
178	1.5.3.2 CJB Components	25 days	Tue 10/1/02	Mon 11/4/02
179	1.5.3.3 Fiber Optic Converte A omponents	25 days	Tue 10/1/02	Mon 11/4/02
180	1.5.3.4 ANT/UWV Interface ssy	25 days	Tue 10/1/02	Mon 11/4/02
181	1.5.3.5 CCG Interconnect Ca Materials (DSS-27 & -34)	25 days	Tue 10/1/02	Mon 11/4/02
182	**1.5.3.6 Computer Procurement for for DSS-34 & -27 A**	**20 days**	**Tue 10/1/02**	**Mon 10/28/02**
183	1.5.3.6.1 DSS-27	20 days	Tue 10/1/02	Mon 10/28/02
184	1.5.3.6.2 DSS-34	20 days	Tue 10/1/02	Mon 10/28/02
185	***1.5.3.7 H/W Procurement Burden***	***0 days***	***Mon 11/4/02***	***Mon 11/4/02***
186				
187	**1.5.4 H/W Assembly**	**54 days**	**Tue 10/29/02**	**Fri 1/17/03**
188	**1.5.4.1 ILA Assembly**	**12 days**	**Tue 10/29/02**	**Wed 11/13/02**

15			Tue Jan 16		
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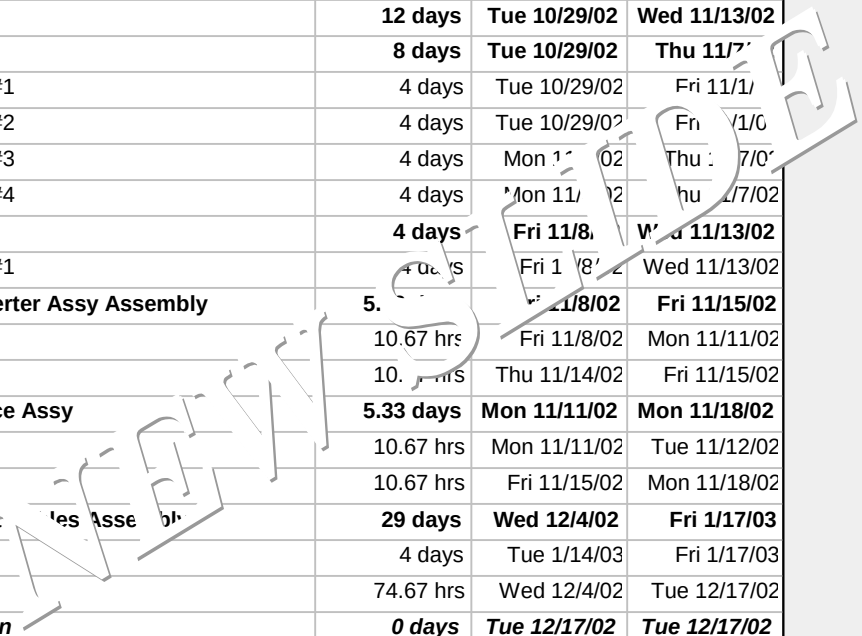
Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish
189	1.5.4.1.1 DSS-34	6 days	Tue 10/29/02	Tue 11/5/02
190	1.5.4.1.2 DSS-27	6 days	Wed 11/6/02	Wed 11/13/02
191	**1.5.4.2 CJB Assembly**	**12 days**	**Tue 10/29/02**	**Wed 11/13/02**
192	**1.5.4.2.1 DSS-34**	**8 days**	**Tue 10/29/02**	**Thu 11/7**
193	1.5.4.2.1.1 CJB #1	4 days	Tue 10/29/02	Fri 11/1
194	1.5.4.2.1.2 CJB #2	4 days	Tue 10/29/02	Fri 11/0
195	1.5.4.2.1.3 CJB #3	4 days	Mon 11/ 02	Thu 1 7/0
196	1.5.4.2.1.4 CJB #4	4 days	Mon 11/ 02	hu 1/7/02
197	**1.5.4.2.2 DSS-27**	**4 days**	**Fri 11/8**	**W 11/13/02**
198	1.5.4.2.2.1 CJB #1	4 days	Fri 1 /8/	Wed 11/13/02
199	**1.5.4.3 Fiber Optic Converter Assy Assembly**	**5.**	**11/8/02**	**Fri 11/15/02**
200	1.5.4.3.1 DSS-27	10.67 hrs	Fri 11/8/02	Mon 11/11/02
201	1.5.4.3.2 DSS-34	10. hrs	Thu 11/14/02	Fri 11/15/02
202	**1.5.4.4 ANT/UWV Interface Assy**	**5.33 days**	**Mon 11/11/02**	**Mon 11/18/02**
203	1.5.4.4.1 DSS-27	10.67 hrs	Mon 11/11/02	Tue 11/12/02
204	1.5.4.4.2 DSS-34	10.67 hrs	Fri 11/15/02	Mon 11/18/02
205	**1.5.4.5 CCG Interconnec les Asse bl**	**29 days**	**Wed 12/4/02**	**Fri 1/17/03**
206	1.5.4.5.1 DSS-27	4 days	Tue 1/14/03	Fri 1/17/03
207	1.5.4.5.2 DSS-34	74.67 hrs	Wed 12/4/02	Tue 12/17/02
208	***1.5.4.6 MTC Labor Burden***	***0 days***	***Tue 12/17/02***	***Tue 12/17/02***
209				
210	**1.5.5 H/W Unit Test**	**17.5 days**	**Wed 11/6/02**	**Mon 12/2/02**
211	**1.5.5.1 ILA Assembly**	**5 days**	**Wed 11/6/02**	**Tue 11/12/02**
212	1.5.5.1.1 DSS-34	2.5 days	Wed 11/6/02	Fri 11/8/02
213	1.5.5.1.2 DSS-27	2.5 days	Fri 11/8/02	Tue 11/12/02
214	**1.5.5.2 CJB Assembly**	**12.5 days**	**Wed 11/13/02**	**Mon 12/2/02**
215	**1.5.5.2.1 DSS-34**	**10 days**	**Wed 11/13/02**	**Wed 11/27/02**

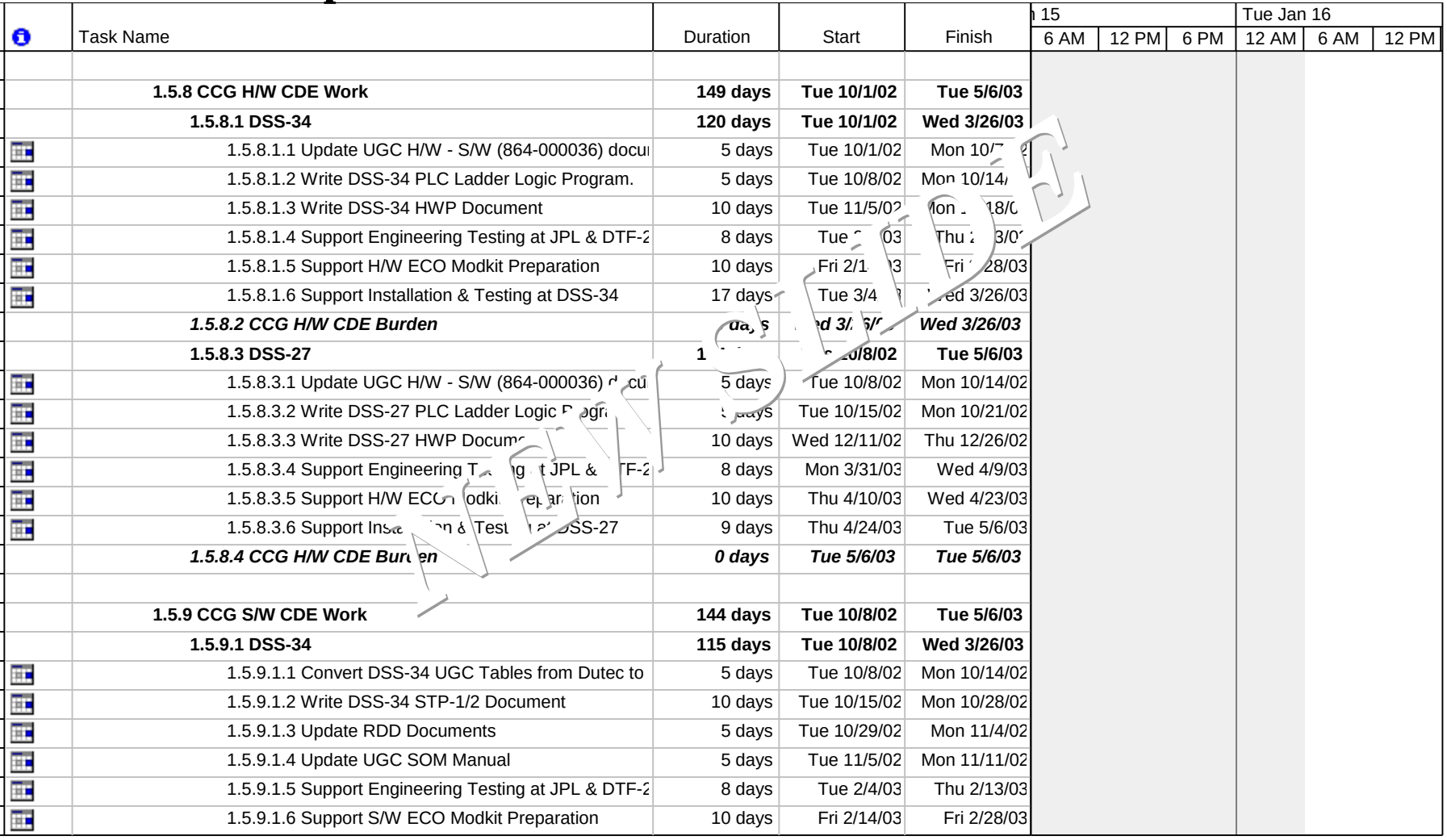


Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish
216	1.5.5.2.1.1 CJB #1	2.5 days	Wed 11/13/02	Fri 11/15/02
217	1.5.5.2.1.2 CJB #2	2.5 days	Fri 11/15/02	Tue 11/19/02
218	1.5.5.2.1.3 CJB #3	2.5 days	Wed 11/20/02	Mon 11/25/02
219	1.5.5.2.1.4 CJB #4	2.5 days	Mon 11/25/02	Wed 11/
220	**1.5.5.2.2 DSS-27**	**2.5 days**	**Thu 11/28/02**	**M 12/2/0**
221	1.5.5.2.2.1 CJB #1	2.5 days	Thu 11/28/0	Mon /2/0
222	***1.5.5.3 MTC Labor Burden***	***0 days***	***Mon 12 2***	***n 12 /02***
223				
224	**1.5.6 Drawings**	**50 days**	**e 10/29/**	**Mon 1/13/03**
225	**1.5.6.1 DSS-27**	**5 days**	**ed 1 4/02**	**Mon 1/13/03**
226	1.5.6.1.1 9606669, DSS-27 UWV S/S		12/4/02	Tue 12/10/02
227	1.5.6.1.2 9606621, DSS-27 S-Band Feed Assem y	5 days	Wed 12/11/02	Tue 12/17/02
228	1.5.6.1.3 9606619, DSS-27 Functional Blo Dia n	5 days	Wed 12/18/02	Thu 12/26/02
229	1.5.6.1.4 9606620, DSS-27 UWV C ie Pack e	5 days	Fri 12/27/02	Mon 1/6/03
230	1.5.6.1.5 9616xxx, DSS-27 CCG I rc nnect D. win	5 days	Tue 1/7/03	Mon 1/13/03
231	**1.5.6.2 DSS-34**	**25 days**	**Tue 10/29/02**	**Tue 12/3/02**
232	1.5.6.2.1 9608335, DS W S/	5 days	Tue 10/29/02	Mon 11/4/02
233	1.5.6.2.2 9608318, DSS 34 S- d X-Band Feed Asse	5 days	Tue 11/5/02	Mon 11/11/02
234	1.5.6.2.3 9608319, DSS- Functional Block Diagram	5 days	Tue 11/12/02	Mon 11/18/02
235	1.5.6.2.4 9608299, DSS-34 UWV Cable Package	5 days	Tue 11/19/02	Tue 11/26/02
236	1.5.6.2.5 9616488, DSS-34 CCG Interconnect Drawin	5 days	Wed 11/27/02	Tue 12/3/02
237	***1.5.6.3 MTC Labor Burden***	***0 days***	***Tue 12/3/02***	***Tue 12/3/02***
238				
239	**1.5.7 Integrated Testing of CCG H/W Assemblies**	**10 days**	**Tue 1/21/03**	**Mon 2/3/03**
240	1.5.7.1 DSS-34 CCG H/W	5 days	Tue 1/21/03	Mon 1/27/03
241	1.5.7.2 DSS-27 CCG H/W	5 days	Tue 1/28/03	Mon 2/3/03
242	***1.5.7.3 MTC Labor Burden***	***0 days***	***Mon 2/3/03***	***Mon 2/3/03***

Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish
243				
244	**1.5.8 CCG H/W CDE Work**	**149 days**	**Tue 10/1/02**	**Tue 5/6/03**
245	**1.5.8.1 DSS-34**	**120 days**	**Tue 10/1/02**	**Wed 3/26/03**
246	1.5.8.1.1 Update UGC H/W - S/W (864-000036) docu	5 days	Tue 10/1/02	Mon 10/7/2
247	1.5.8.1.2 Write DSS-34 PLC Ladder Logic Program.	5 days	Tue 10/8/02	Mon 10/14/
248	1.5.8.1.3 Write DSS-34 HWP Document	10 days	Tue 11/5/02	Mon 18/0
249	1.5.8.1.4 Support Engineering Testing at JPL & DTF-2	8 days	Tue 03	Thu 3/0
250	1.5.8.1.5 Support H/W ECO Modkit Preparation	10 days	Fri 2/1 03	Fri 28/03
251	1.5.8.1.6 Support Installation & Testing at DSS-34	17 days	Tue 3/4	ed 3/26/03
252	***1.5.8.2 CCG H/W CDE Burden***	***da s***	***ed 3/ 6/***	***Wed 3/26/03***
253	**1.5.8.3 DSS-27**	**1**	**0/8/02**	**Tue 5/6/03**
254	1.5.8.3.1 Update UGC H/W - S/W (864-000036) d cu	5 days	Tue 10/8/02	Mon 10/14/02
255	1.5.8.3.2 Write DSS-27 PLC Ladder Logic P ogr	5 days	Tue 10/15/02	Mon 10/21/02
256	1.5.8.3.3 Write DSS-27 HWP Docum	10 days	Wed 12/11/02	Thu 12/26/02
257	1.5.8.3.4 Support Engineering T g t JPL & TF-2	8 days	Mon 3/31/03	Wed 4/9/03
258	1.5.8.3.5 Support H/W ECO odki ep ar tion	10 days	Thu 4/10/03	Wed 4/23/03
259	1.5.8.3.6 Support Ins a on & Test a DSS-27	9 days	Thu 4/24/03	Tue 5/6/03
260	***1.5.8.4 CCG H/W CDE Bur en***	***0 days***	***Tue 5/6/03***	***Tue 5/6/03***
261				
262	**1.5.9 CCG S/W CDE Work**	**144 days**	**Tue 10/8/02**	**Tue 5/6/03**
263	**1.5.9.1 DSS-34**	**115 days**	**Tue 10/8/02**	**Wed 3/26/03**
264	1.5.9.1.1 Convert DSS-34 UGC Tables from Dutec to	5 days	Tue 10/8/02	Mon 10/14/02
265	1.5.9.1.2 Write DSS-34 STP-1/2 Document	10 days	Tue 10/15/02	Mon 10/28/02
266	1.5.9.1.3 Update RDD Documents	5 days	Tue 10/29/02	Mon 11/4/02
267	1.5.9.1.4 Update UGC SOM Manual	5 days	Tue 11/5/02	Mon 11/11/02
268	1.5.9.1.5 Support Engineering Testing at JPL & DTF-2	8 days	Tue 2/4/03	Thu 2/13/03
269	1.5.9.1.6 Support S/W ECO Modkit Preparation	10 days	Fri 2/14/03	Fri 2/28/03



Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish	Cost	Resource Names
270	1.5.9.1.7 Support Installation & Testing at DSS-34	17 days	Tue 3/4/03	Wed 3/26/03	$3,712.80	ackie Kwok[30%]
271	***1.5.9.2 CCG S/W CDE Burden***	***0 days***	***Wed 3/26/03***	***Wed 3/26/03***	***$120.00***	
272	**1.5.9.3 DSS-27**	**139 days**	**Tue 10/15/02**	**Tue 5/6/03**	**$14,581.84**	
273	1.5.9.3.1 Convert DSS-27 UGC Tables from Dutec to	5 days	Tue 10/15/02	Mon 10/	$1,092.00	ackie Kwok[30%]
274	1.5.9.3.2 Write DSS-27 STP-1/2 Document	10 days	Tue 10/22/02		2,184.00	ackie Kwok[30%]
275	1.5.9.3.3 Update RDD Documents	5 days	Tue 11/5/0		$1,092.00	ackie Kwok[30%]
276	1.5.9.3.4 Update UGC SOM Manual	5 days	Tue 1		$1,092.00	ackie Kwok[30%]
277	1.5.9.3.5 Support Engineering Testing at JPL & DTF-2	8 days	Mon 3/3		$1,747.20	ackie Kwok[30%]
278	1.5.9.3.6 Support S/W ECO Modkit Preparation	10 days	Thu 4/10	Wed 4/23/03	$3,640.00	ackie Kwok[50%]
279	1.5.9.3.7 Support Installation & Testing at DSS-27	9 days	Thu 4/	Tue 5/6/03	$3,734.64	ackie Kwok[57%]
280	***1.5.9.4 CCG S/W CDE Burden***		***5/6/03***	***Tue 5/6/03***	***$120.00***	
281						
282	**1.5.10 Engineering Testing @ JPL & DTF-21**	**46 days**	**Tue 2/4/03**	**Wed 4/9/03**	**$5,634.72**	
283	**1.5.10.1 DSS-34**	**8 days**	**Tue 2/4/03**	**Thu 2/13/03**	**$2,580.00**	
284	1.5.10.1.1 DSS-34 CCG H/W & S integrated st at	5 days	Tue 2/4/03	Mon 2/10/03	$1,500.00	y Anderson[50%]
285	1.5.10.1.2 DSS-34 CCG H/W & S/ integrated test at	3 days	Tue 2/11/03	Thu 2/13/03	$1,080.00	y Anderson[60%]
286	**1.5.10.2 DSS-27**	**8 days**	**Mon 3/31/03**	**Wed 4/9/03**	**$2,580.00**	
287	1.5.10.2.1 DSS-27 CCG H/W S/W integrated test at	5 days	Mon 3/31/03	Fri 4/4/03	$1,500.00	y Anderson[50%]
288	1.5.10.2.2 DSS-27 CCG H/W & S/W integrated test at	3 days	Mon 4/7/03	Wed 4/9/03	$1,080.00	y Anderson[60%]
289	***1.5.10.3 MTC Labor Burden***	***0 days***	***Thu 2/13/03***	***Thu 2/13/03***	***$474.72***	
290						
291	**1.5.11 ECO Modkit Preparation**	**48 days**	**Fri 2/14/03**	**Wed 4/23/03**	**$3,276.00**	
292	**1.5.11.1 DSS-34**	**10 days**	**Fri 2/14/03**	**Fri 2/28/03**	**$1,500.00**	
293	1.5.11.1.1 DSS-34 H/W ECO Modkit Preparation	10 days	Fri 2/14/03	Fri 2/28/03	$1,500.00	y Anderson[25%]
294	1.5.11.1.2 DSS-34 S/W ECO Modkit Preparation	10 days	Fri 2/14/03	Fri 2/28/03	$0.00	
295	1.5.11.1.3 DSS-34 ECO Modkits Delivered to DLF	0 days	Fri 2/28/03	Fri 2/28/03	$0.00	
296	**1.5.11.2 DSS-27**	**10 days**	**Thu 4/10/03**	**Wed 4/23/03**	**$1,500.00**	

Phase 1 Implementation Planned Schedule - Full Detail

ID	Task Name	Duration	Start	Finish	Cost	Resource Names
297	1.5.11.2.1 DSS-27 H/W ECO Modkit Preparation	10 days	Thu 4/10/03	Wed 4/23/03	$1,500.00	y Anderson[25%]
298	1.5.11.2.2 DSS-27 S/W ECO Modkit Preparation	10 days	Thu 4/10/03	Wed 4/23/03	$0.00	
299	1.5.11.2.3 DSS-27 ECO Modkits Delivered to DLF	0 days	Wed 4/23/03	Wed 4/23/03	$0.00	
300	***1.5.11.3 MTC Labor Burden***	***0 days***	***Fri 2/28/03***	***Fri 2/28/03***	***$ 76.00***	
301						
302	**1.5.12 DSS-34 Installation, Testing & Training**	**19 days**	**Mon 3/3/03**	**F 03**	**$ 00**	
303	1.5.12.1 Schedule and hold DSS-34 Test Readiness Revie	5 days	Mon 3/3/03	n 3/1	$0.00	],Jackie Kwok[0%
304	1.5.12.2 JPL Personnel Travel to CDSCC	2 days	Mon 3/	W 3/12	$0.00	ISE TRAVEL[0%
305	1.5.12.3 Pre-Downtime Testing & Training	5 days	u 3/13/	We 3/1 03	$0.00	
306	**1.5.12.4 DSS-34 Downtime Period**	**7 days**	**u 3/20/03**	**F 3/28/03**	**$0.00**	
307	1.5.12.4.1 Day 1	1 d	u 3/2 0	Thu 3/20/03	$0.00	
308	1.5.12.4.2 Day 2	1 d	3/ 03	Fri 3/21/03	$0.00	
309	1.5.12.4.3 Day 3	1 day	on 3/24/03	Mon 3/24/03	$0.00	
310	1.5.12.4.4 Day 4	1 da	Tue 3/25/03	Tue 3/25/03	$0.00	
311	1.5.12.4.5 Day 5	1 day	Wed 3/26/03	Wed 3/26/03	$0.00	
312	1.5.12.4.6 Day 6	1 day	Thu 3/27/03	Thu 3/27/03	$0.00	
313	1.5.12.4.7 Day 7	1 day	Fri 3/28/03	Fri 3/28/03	$0.00	
314	***1.5.12.5 DSS-34 Returned to pera ns***	***0 days***	***Fri 3/28/03***	***Fri 3/28/03***	***$0.00***	
315	***1.5.12.6 MTC Labor B***	***0 days***	***Fri 3/28/03***	***Fri 3/28/03***	***$0.00***	
316						
317	**1.5.13 DSS-27 Installation, T sting & Training**	**9 days**	**Thu 4/24/03**	**Tue 5/6/03**	**$4,339.33**	
318	1.5.13.1 Schedule and h d DSS-27 Test Readiness Revie	5 days	Thu 4/24/03	Wed 4/30/03	$0.00	
319	1.5.13.2 Pre-Downtime Testing & Training	2 days	Thu 5/1/03	Fri 5/2/03	$1,440.00	son,Tom Du[50%]
320	**1.5.13.3 DSS-27 Downtime Period**	**2 days**	**Mon 5/5/03**	**Tue 5/6/03**	**$1,560.00**	
321	1.5.13.3.1 Day 1	1 day	Mon 5/5/03	Mon 5/5/03	$720.00	son,Tom Du[50%]
322	1.5.13.3.2 Day 2	1 day	Tue 5/6/03	Tue 5/6/03	$840.00	nderson,Tom Du
323	***1.5.13.4 DSS-27 Returned to Operations***	***0 days***	***Tue 5/6/03***	***Tue 5/6/03***	***$0.00***	
324	***1.5.13.5 MTC Labor Burden***	***0 days***	***Tue 5/6/03***	***Tue 5/6/03***	***$276.00***	
325	1.5.13.6 JPL Travel to DSS-27	0 days	Mon 5/5/03	Mon 5/5/03	$1,000.00	
326	1.5.13.7 JPL Travel Burden	0 days	Mon 5/5/03	Mon 5/5/03	$63.33	

15 | 6 AM | 12 PM

ECO Modkit Deliverables

- **110.101 ECO Modkit (CCG H/W)**
  - Two (2) IBM-compatible Personal Computer w/ Keyboard, Monitor & Mouse (Dual-Boot Windows - OS/2 Operating Systems)
  - One (1) Fiber Optic Converter Assembly (9612257)
  - One (1) Interlock Logic Assembly (ILA, 9612240)
  - Three (3) 28-V Command J-Box Assemblies (CJBs, 9612215)
  - One (1) UWV/ANT Interface Assembly (9615375)
  - Set of CCG Interconnect Cables
  - Documentation
    - Released Assembly and Interconnect Drawings
    - Installation Procedure Document (HWP)
    - Operations & Maintenance Manual (OMM)
- **MESkit (Hardware Spare Components Modkit)**
  - Per Maintenance & Sparing Agreement

ECO Modkit Deliverables (continued)

- **110.102 ECO Modkit (UGC S/W)**
  - UGC Executable (DBU-5529-OP-C version **3.0.6**)
  - IBM OS/2 WARP 3.0 Operating System, Windows NT Operating System
  - Documentation: RDDs
- **110.104 ECO Modkit (PLC Software)**
  - PLC Ladder Logic Programs
  - COTS Software
    - RSLogix500, RSNetworx, Windows NT
  - Documentation: RDD document
- **110.105 ECO Modkit (UGC Tables)**
  - UGC Tables (DBU-5529-TB-C, version 3.xx)
  - Documentation: RDD, SOM, STP-1/2

34-m BWG Antenna Switch Count

- Assumptions
  - S-Band feed installed at DSS-24, -34 and -54
  - X/X/Ka-band Feed will be installed at a later date
    - Switch count is same before and after X/X/Ka-band Upgrade.
    - X/X/Ka-Band Feed is same configuration as will be installed at DSS-26/55
  - Test Signal Select Assembly (TSSA) is modified during CCG installation
  - Antenna interface is the same as DSS-25 and -26
  - ETX interface is the same as DSS-25 and -26

34-m BWG Antenna Switch Count (continued)

- S-Band Switches
  - Three (3) WR-430 Waveguide switches
    - Waterload Switch
    - Ambient Load Switch
    - LNA select Switch
  - Five (5) Coaxial switches
    - (1) MCA Pre/Post Switch
    - (3) TSSA Switches
    - (1) S-band distribution switch
  - One (1) Polarizer Drive

- Total S-band Switches = Nine (9)

34-m BWG Antenna Switch Count (continued)

- X-band Switches Before X/X/Ka-band Upgrade
  - DSS-24
    - Waveguide switches
      - 1 WR-125 Ambient Load Switch
      - 1 LNA Select Switch
        - will be added during 20-kW TXR Upgrade
      - 1 WR-137 Waterload switch
    - Coaxial switches
      - 1 MCA Pre/Post Switch
      - 2 TSSA Switches
    - 1 Polarizer Drive
  - Total X-band Switches = 7
- Total (All Switches) = 16

34-m BWG Antenna Switch Count (continued)

- X-Band Switches Before X/X/Ka-band Upgrade
  - DSS-34 & DSS-54
    - Waveguide switches
      - 1 WR-125 Ambient Load Switch
      - 1 WR-125 LNA Select Switch
      - 1 WR-137 Waterload Switch
      - 2 WR-112 RCV Mode selector Switches
    - Coaxial switches
      - 2 MCA Pre/Post Switches
      - 2 TSSA Switches
    - One Polarizer Drive
  - Total X-band Switches = 10
- Total (All Switches) = 19

34-m BWG Antenna Switch Count (continued)

- Switches after X/X/Ka-band & 20-kW X-band TXR Upgrades
  - DSS-24, DSS-34, DSS-54
    - Switches
      - 4 Ka-band
      - 5 X-band
      - 9 S-band
    - Special
      - 1 Aperture load controller
      - 1 CCG/LNA select switch
  - Total Switches = 20

824-16, Rev. F Requirements Compliance Matrix

824-016 Rev. F Section	FRD 824-016 Rev. F Requirement	CCG Design Compliance
3.2.6	Monitor and Control	
3.2.6.1	General. The Microwave Subsystem at the 70m, 34m HEF, and 34m BWG sites shall include a microwave subsystem controller (USC). The prime purpose of this controller is to provide control of, and visibility into, the microwave configuration by the DMC operators and to combine as many FEA functions as is reasonable into one controller. The approach to be used shall be that of a smart controller, one for each FEA, in the control room with minimal intelligence in the antenna. Each FEA shall have its own controller to allow maintenance activity on one antenna while another is tracking, and also to improve reliability. The controller has functions in three separate areas of activity: the first is to configure the subsystem; the second is to monitor various parameters; the third is to provide displays. The controller shall accept commands from the DMC and configure the subsystem accordingly. Setting the configuration of the test signal path for pre- and post-pass calibration as well as SPTs and maintenance is included in the configuration area of activity. Establishing configuration shall include setting of waveguide and coaxial switches as well as polarization and other miscellaneous controls that may be required. In addition to assuming all the functions presently performed by the CCG or USC, the controller shall perform additional functions of switching test signals into and through the LNA instrumentation assemblies and monitoring the status of the LNAs.	YES (Hardware & Software)

824-16, Rev. F Requirements Compliance Matrix (continued)

824-016 Rev. F Section	FRD 824-016, Rev. F Requirement	CCG Design Compliance
3.2.6.2	Control Requirements. The controller's functions fall into three areas: establishing configuration; monitoring the subsystem elements; displaying the configuration and certain monitor data.	YES (Hardware/ Software)
3.2.6.2.1	The controller shall control all switches in the RF signal path. This includes the following: polarizer, LNA selection, RF distribution selection, ambient-load calibration selection, and other switches which may exist for various special purposes.	YES (Hardware/ Software)
3.2.6.2.2	The controller shall control the test signal routing switches and all switches that control the test signal routing.	YES (Hardware/ Software)
3.2.6.2.3	Provision shall be made to control up to 80 on/off items and up to 50 four-position items.	YES – Software
3.2.6.2.4	The controller shall be operable from either of two locations: local or remote. The local shall permit operation at the assembly itself, while the remote shall permit operation by the DMC across the LAN.	YES (Hardware/ Software)
3.2.6.2.5	Operation from the remote location shall not preclude operation from the local location, but safeguards shall be designed to prevent inadvertent loss of data caused by erroneous local operation. The local control should have a standalone capability, not dependent on other subsystems.	YES (Hardware/ Software)
3.2.6.2.6	It shall be possible to lock out remote operation.	YES (Software)
3.2.6.2.7	The design shall allow operators to develop and store their own configurations.	YES (Software)
3.2.6.2.8	Software shall be written such that changes in the hardware configuration of the station can be incorporated by changing table entries, rather than by rewriting the program.	YES (Software)

824-16, Rev. F Requirements Compliance Matrix (continued)

824-016 Rev. F Section	FRD 824-016, Rev. F Requirement Text	CCG Design Compliance
3.2.6.2.9	Control and sensing cables are to work at low voltage, less than 30 volts, with relays on the controlled device to switch to higher voltage, if necessary.	Yes (Hardware)
3.2.6.2.10	Stored configurations that set all devices into the desired configuration shall be the prime mode of operation.	YES (Software)
3.2.6.2.11	The design shall allow for control of individual devices.	YES (Hardware/Software)
3.2.6.2.12	All possible configurations of the elements in the signal path shall be coded and stored in permanent memory under a unique name.	YES (Software)
3.2.6.2.13	Software shall be designed to be common to all FEAs, with tables to allow for the different configurations.	YES (Software)
3.2.6.2.14	Establishment of the desired configuration shall not require more than one operator-controlled input (OCI) from the DMC.	YES (Software)
3.2.6.2.15	The controller shall perform self-test on the UWV and identify failed items to the lowest replaceable unit.	Yes (Hardware)
3.2.6.3	Monitor Requirements	
3.2.6.3.1	The controller shall monitor the status and position of each item in the subsystem that it controls and report any changes to the DMC.	YES (Hardware/Software)
3.2.6.3.2	Updated configuration data shall be sent to the DMC with every configuration change and when requested.	YES (Software)
3.2.6.3.3	Provision shall be made to monitor at least six masers and four HEMTs per FEA.	YES (Hardware/Software)
3.2.6.3.4	Provision shall be made for monitoring of the interlocks, and the status of each interlock shall be made available for display by the controller to aid in fault isolation.	YES (Hardware/Software)

824-16, Rev. F Requirements Compliance Matrix (continued)

824-016 Rev. F Section	FRD 824-016, Rev. F Requirement	CCG Design Compliance
3.2.6.3.5	All configuration changes shall be logged; and this log shall be maintained for at least 72 hours.	Yes (Software)
3.2.6.3.6	All data logging shall be referenced to station time, obtained from the FTS.	Yes (Software)
3.2.6.4	Display Requirements	YES (Software)
3.2.6.4.1	The controller shall generate a display for the LMT and send either a display or data for generation of a display to the DMC.	YES (Software)
3.2.6.4.2	The graphical displays, which shall consist of graphic and alphanumeric parts, shall present a picture of the entire FEA configuration, one band at a time, to the DMC operator.	YES (Software)
3.2.6.4.3	The graphic section shall present a clear map of the essential parts of the equipment that is under control, with switch positions shown as configured.	YES (Software)
3.2.6.4.4	The alphanumeric display portion shall include the configuration name.	YES (Software)
3.2.6.4.5	The display shall clearly indicate failed elements and shall be updated when conditions change.	YES (Software)
3.2.6.4.6	Displays shall show the actual position of switches, not the position that was commanded.	YES (Software)
3.2.6.4.7	The test signal path configuration shall be shown on a display separate from that of the RF signal path configuration.	YES (Software)
3.2.6.4.8	Similar graphics shall be provided at the controller rack for use by maintenance personnel.	YES (Software)
3.2.6.4.9	Displays shall include time tags which are obtained from station time.	YES (Software)

824-16, Rev. F Requirements Compliance Matrix (continued)

824-016 Rev. F Section	FRD 824-016, Rev. F Requirement	CCG Design Compliance
3.2.7	RF Safety Interlocks. The RF Safety Interlocks shall protect personnel environment and equipment from hazardous or damaging RF power. It shall monitor Antenna, Microwave, and Transmitter Subsystem critical components (doors, hatches, mirrors, switches) and operational status (BEAM ON, DRIVE ON, ELEVATION POINTING ANGLE) to assure safe routing of RF power through these subsystems. Exposure of personnel to RF power densities shall be no greater than 1 milliwatt per square centimeter during eight hours. The interlocks shall prevent damage to DSN equipment from RF power. Safety of personnel shall be the highest priority. The interlocks shall inhibit movement of critical components in the RF path. The interlocks shall inhibit the generation of RF power from the Transmitter subsystem if a valid critical path has not been established. The interlocks shall also inhibit generation of RF power if any personnel access to areas of hazardous RF power is detected. The interlocks shall be fail-safe. Software shall not be used in the primary control of interlocks but may be used to report interlock conditions.	YES (Hardware)
3.2.7.1	Access Danger. Upon receipt of an "Access Danger" signal or signals from the Antenna Subsystem, the Microwave Subsystem shall send a "Transmitter Inhibit" signal to the Exciter-Transmitter Subsystem.	YES (Hardware)
3.2.7.2	Mirror Position Violation. Upon receipt of a "Mirror Position Violation" signal or signals from the Antenna Subsystem, the Microwave Subsystem shall send a "Transmitter Inhibit" signal to the Exciter-Transmitter Subsystem.	YES (Hardware)
3.2.7.3	Transmitter Beam On. When the transmitter beam is on, all components of the Antenna Mechanical and Microwave Subsystems in the RF path shall be inhibited.	Yes (Hardware)

828-1, Rev. 5 Requirements Compliance Matrix

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
1.1 Purpose	The purpose of this document is to levy RF System requirements from the 828-1 Functional Requirements Document (RFD) on the 70 m Antenna Microwave (UWV) Subsystem=s Configuration Control Group (CCG) Task. The RF System monitor and control requirements consist of requirements placed upon it by The DSN Monitor and Control System (MON) for the automated control of DSCC subsystems. and of requirements derived for the internal control, monitoring and protection of personnel and equipment.	N/A
1.2 Scope	The Monitor and Control requirements extend to all stations in the DSN, including the 70 m Antennas (DSS-14,43 & 63), 34 m High Efficiency (HEF) Antennas (DSS-15, 45, &65), 34 m Beam Waveguide (BWG) Antennas (DSS-24, 25, 26, 34, & 54) and 34 m High Speed Beam Waveguide (HSB) antennas (DSS-27 & 28). The subsystems affected by these requirements include the following: 1. Antenna mechanical (ANT) 2. Antenna Microwave (UWV) 3. Transmitter (TXR) 4. Exciter/Transmitter (ETX)	N/A
2	Interfaces	N/A
2.1	Antenna Mechanical/ Antenna Microwave (ANT/UWV)	N/A
2.1.1 Elevation 10 degree Interlock	The RF system prohibits the radiation of RF power into the antenna free space below 10 degrees elevation When the pointing angle of the antenna goes below 10 degrees elevation, the radiation of RF power will be terminated. The ANT provides an indication of the antenna at or above 10 Degree elevation angle to the UWV. The UWV analyzes the elevation interlock with other configuration items and determines the safe to transmit RF power condition. The safe to transmit interlock enables the ETX to radiate RF power.	YES (H/W)

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
2.1.2 Antenna doors and hatches	The UWV shall provide a closed position indicator of each ANT door and hatch that senses personnel accessing areas of high RF radiation. UWV shall remove the beam enable signal to the ETX when a door or hatch is opened. The ETX shall terminate the generation of RF power when the beam enable is removed.	Yes (H/W)
2.1.3 Reflector positioner	The ANT monitors the position of all movable reflectors on the antenna and provides position indicators to the UWV. The UWV accepts the indicators, analyzes them with other configuration items and presents a safe to transmit enable to the ETX The ANT reflectors or reflector motions to be monitored include but are not limited to the following 1. Dichroic Plate Positioners 2. Ellipsoid positioners 3. Subreflector rotation positioners	Yes (H/W)
2.1.4 Inhibits	The ANT shall accept inhibit signal from the UWV when the beam of any transmitter is on and the ANT inhibits or prevents the movement of all RF path reflectors for any transmitter that is configured to radiate RF power to the antenna. The UWV determines the uplink path and generates the inhibit signals based on the configurations. The motion of reflectors may not require inhibits if the RF radiation of any transmitter is directed into a ETX calibration load.	Yes (H/W)
2.2	Antenna Microwave/Exciter-Transmitter (UWV/ETX or TXR)	N/A
2.2.1 ABEAM ON≅	The ETX presents to the UWV CCG system a positive indicator of ABEAM ON≅ when the transmitter beam of any transmitter is on. Based on this indicator the UWV CCG shall inhibit movement of all uplink path elements. All offline or unused feed systems are to be switched into a safe configuration to prevent damage. Only one transmitter is required to radiate to the antenna at a time. The offline transmitters may be allowed to radiate into the calibration load with out interference with other activities.	Yes (H/W)

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
2.2.2 Beam Enable	The UWV CCG shall present to the ETX a positive signal indicating that the Uplink Path safety Criteria has been met (I. e. It is safe to radiate RF power with the AOK To Beam On≅).	Yes (H/W)
2.2.3 Drive Enable	The UWV shall present to the ETX a positive indication that the antenna is at or above 10 degrees elevation. The ETX shall control the drive signal from the exciter to power amplifier to prohibit the radiation of RF power below 10 degrees elevation, except when radiating into the calibration load.	Yes (H/W)
2.2.4 Waveguide Interfaces	The waveguide interface between UWV and ETX is at the water load switch. The location of the water load switch will be as close as possible to the ETX last active component at the output of the power amplifier assembly. The water load is mounted on one adjacent switch port within 15 cm of the switch.	Yes (H/W)
2.3 Frequency and Timing (FTS)		N/A
2.3.1 Timing Signal	The FTS shall supply the timing signal for the controller of the following subsystems so that time tagging of all messages and events can be accomplished. 1. Antenna Microwave (UWV) 2. Antenna Mechanical (ANT) 3. Exciter Transmitter (ETX and TXR)	N/A
3 Requirements	The following sections are applicable to all subsystem controllers. Requirements levied on specific subsystems are noted in the requirements. Subsystems shall present an interface for remote control and monitoring which conform to the standard interface based on messages as described by the Documents 890-131 and 890-132. For subsystems developed after June 1,1996 the standard interface on application program Interfaces (API) shall conform to Document 820-19, module MON-01 Monitor and Control Service Standard.	N/A

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.1 Full Remote M&C	The subsystem shall be fully monitored and controlled by the connection operator. (MON595) This shall also be referred to as NMC Operation. The subsystem shall also have the capability to be fully monitored and controlled from the SPC and the FEA independently (I. e. Operation from the FEA area is independent from the SPC and SPC control (subsystem stand alone capability) and operation from the SPC is independent of the NMC control. The automated monitor and control of the subsystem by the NMC connection operator is dependant on the SPC controller operation.	Yes
3.1.1 Operation from Central Location	The subsystem shall be operable from Network Monitor and Control Consoles at JPL through the NMC. (MON570).	Yes
3.1.2 Operation from DSCC	The subsystem shall be operated from the Monitor and Control Consoles at each DSCC through the NMC. (MON571)	Yes
3.1.3 Positive Closed-loop Control	The subsystem shall communicate with the MON system using positive closed-loop control, consisting of the following. (MON596) 3.1.2.1 The subsystem receives a directive 3.1.2.2 The subsystem acknowledges receipt of the directive. 3.1.2.3 The subsystem reports ? the response to the directive is complete? . 3.1.2.4 The subsystem updates any monitor data that is affected by the directive.	Yes
3.1.4 Standard Directives	The subsystem shall exhibit directives that use a standard format and a common vocabulary for directives that are used by more than one subsystem. (MON733)	Yes
3.1.5 High-Level Status	The subsystem shall provide overall subsystem status information to the MON system. (MON600)	Yes

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.1.6 Subsystem Configuration	The subsystem shall provide the subsystem? s configuration (including whether it is on line) to the MON System. (MON603)	Yes
3.1.7 Evaluation Against Standards and Limits	The subsystem shall provide evaluations of their own configuration and performance against standards and limits supplied by the MON System.	Yes
3.1.8 Detail Status, Configuration and Performance Data	The subsystem shall send the MON extra information when requested (by the 890-132 directive), containing the next lower level of detail of status, configuration and performance data for each status value computed by the subsystem. (MON599) Certain data are excepted from this requirement. 1. Basic status item for which very little judgement is needed for interpretation (switch closures or hardware-detected voltages, signal presence or lock indicators) 2. Status items for which the next lower level of detail is highly voluminous (such as raw voltage samples). 3. Status items for which there is substantial reason to believe that the status indicator will never mislead the diagnosis of the system fault (such as hardware or software failure indicators of a module in the subsystem).	Yes
3.1.9 Reason For Rejection	The subsystem shall clearly inform the operator of the reason for rejection, whenever a directive or other request for action is rejected. (MON23)	Yes
3.1.10 Standard Alarms	The subsystem shall exhibit alarm messages that use a standard format and a common vocabulary for common alarms. (MON24)	Yes
3.1.11 Self-Explanatory Messages	The subsystem shall exhibit alarms and other messages that are self-explanatory and do not require information from other sources to be understood. (MON26)	Yes

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.1.12 Software Version Management	The subsystem shall report which software packages are in use and report incompatibilities. (MON28)	Yes
3.1.13 Subsystem Group Management	The subsystem shall report group configurations, status, performance and status of any redundant equipment. (MON29)	Yes
3.1.14 Subsystem Group Data Reporting	The subsystem shall report configuration, status and performance data to the MON system spontaneously, periodically, or upon request as specified in applicable interface specification documents. (MON31)	Yes
3.1.15 Availability for Monitor Data	The MON shall achieve 94% of monitor data free from missed and false alarms (this equates to approximately 0.2% missed and false alarms per subsystem) measured as a fraction of operating time without regard to whether services are in progress or not. (MON597)	Yes
3.1.16 LAN Communicatio n	The subsystem shall communicate with the MON using Local Area Networks. (MON58)	Yes
3.1.17 Assembly-Level Diagnostics	The subsystem shall isolate faults and out-of-tolerance conditions at the assembly level or lower. (MON30)	Yes
3.1.18 Subsystem Controller Availability	The subsystem without redundant controllers or groups shall experience no more than one interruption of monitor and control functions restorable by re-initialization of software or cycling of power once per week. These interruption shall be constrained to be less than 15 minutes in duration. Outages which require hardware component replacement or repair shall occur no more frequently than once every 5000 hours of service. These outages shall be constrained to no more than 2 hours in duration for 95% of occurrences. This will result in a functional availability of 99.95% except for the 5% of the occurrences requiring more than 2 hours to correct. (MON55)	Yes

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.1.19 Redundant Subsystem Controller Availability	The subsystems with redundant controller shall experience no more than one interruption of monitor and control function per month. These interruptions shall be constrained to be less than 15 minutes in duration. This will result in a functional availability of 99.93%. (MON56)	Yes
3.1.20 Operation After MON Failure	The subsystem controller and process shall be designed such that the subsystem shall continue to operate when a failure in the MON occurs. The subsystem shall operate based on the latest control information received from the MON. For those subsystems requiring sequence control information (I. e. Predicts or ASPs), the subsystem shall provide sufficient storage to complete the pass when a failure in the MON occurs. (MON57). (ASP , Activity Support Package)	Yes
3.1.21 Requirements on Developers		
3.1.21.1 Monitor Data Specification	Developer shall supply a monitor data specification (MDSPECS) file when a subsystem is delivered or monitor data definitions change. (MON1163)	Yes
3.1.21.2 Identification of directives for Automation	Developers shall Identify the directive necessary for automatic operation of a subsystem in the interface agreement between the subsystem and MON. (MON1164)	Yes
3.1.21.3 Control Behavior	Developers shall ensure that directives necessary for automation behave EXACTLY as described in the Software Operators? s Manual (SOM) for the subsystem. (MON1166)	Yes
3.1.21.4 Display Specifications	Developers shall provide Uniform Display System Products (so-called ? UDS binaries?) to the MON for subsystem-generated displays, when a subsystem is delivered or display definitions change. (MON1165)	Yes
3.1.21.5 On-Line Help	Developers shall provide the content for on-line help information when a subsystem is delivered and when the content or rules for selecting information to present are changed. (MON39)	Yes

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.2 Antenna Microwave Subsystem Configuration Control	The Antenna Microwave (UWV) Subsystem shall control the configuration of the subsystem, monitor the status of the elements and report status and action taken to protect both personnel and equipment from RF high power hazard.	Yes
3.2.1 Switch Functions	The subsystem shall control and monitor all switches in the subsystem. These switches consist of but are not limited to the following 1. Waveguide switches 2. Coax switches 3. Relays 4. Microswitches	Yes
3.2.2 Function Indicators	The subsystem shall provide controls and indicators for the following functions. 1. Polarization Selection 2. Receive and Transmit Signal Routing 3. Low Noise Amplifier (LNA) Selection 4. Transmitter Water Load/Antenna Selection 5. Test Signal Routing to the input of the LNA. 6. Diplex or non-diplex Operation 7. RF Distribution of Receive Signal 8. Ambient Load/Antenna Calibration 9. Rain Blower	Yes
3.2.3 Interlock Indicators	The subsystem shall monitor conditions and position indicators other than Switch function, such as but not limited to the following. 1. Temperature of cooling water with analog and go/no go indicators 2. Water flow of each circuit, above/below critical level 3. Doors and hatches, open/closed 4. Nitrogen pressure of each feed, below critical level 5. Reflector positions, position 1, 2, 3, 4, etc, extended/retracted, rotation position, feed location	Yes
3.2.4 Controller Capacity	The subsystem shall provide monitor and control for up to 80 on-off controls, 50 3-position switches.	Yes

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.2.5 Modular Design	The subsystem controller shall be of a modular design such that any one or more feed assemblies can be removed form the system and the remaining systems will continue to function normally. One example is the BWG antenna. One or more of the feeds assemblies, either S-Band, X-Band and/or Ka-Band feed, may be removed from the station and the remaining feeds and transmitters continue operations. A second example is the 70 m station. One or more of the feedcones (SPD, XTR, and/or XKR) may be removed from the tricone and the remaining feeds and transmitters shall continue to operate. A transmitter may only operate into the local water loads if its feed has been removed.	Yes
3.2.6 Stand Alone Operation	The operation of the Controller in the local or remote control shall be stand alone (i. e. The controller shall not depend on any other subsystem to be operational from the local or remote location). The local location means operation from the FEA and remote location means operation from the SPC, not to include operation form the NMC.	Yes
3.2.7 Spare Capacity	The initial CCG design shall provide for 10% spare Switch connection and 10% spare interlocks for future expansion.	Yes
3.2.8 Software Design	The design of the software shall have a core program that controls and monitors the elements of the subsystem and a separate set of configuration tables that define the elements of the subsystem. The software shall be written such that changes in hardware configuration of a station can be incorporated by changing table entries only, rather than by rewriting the program code.	Yes
3.2.9 Prime Configurations	The design shall incorporate stored configurations that set all devices or elements of the subsystem into desired operational configurations which shall be referred to as the prime Configurations.	Yes
3.2.10 Permanent Configuration	All possible operational configurations of the elements in the subsystem shall be coded and stored in non- volatile memory identified by unique names.	Yes

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.2.11 Element Control	The design shall allow for control of individual devices or elements.	Yes
3.2.12 User Defined Configuration	The design shall allow the operator to develop and store unique configurations and save with user defined names for future use.	Yes
3.2.13 Common Software	The program software shall be designed to be common to all controllers allowing the configuration differences to be accounted for in the configuration tables.	Yes
3.2.14 Subsystem Configuration	The configuration of the subsystem shall be accomplished with no more than one Operator Control Input (OCI).	Yes
3.2.15 Interlock Monitor	The UWV CCG controller shall monitor all interlocks. All indicators shall be monitored and all enable and inhibits issued for protection of personnel and equipment without operator intervention.	Yes
3.2.16 Interlock Displays	The controller shall provide displays of all interlocks to aid in the fault isolation. This display shall be available to any control point, local, remote and NMC.	Yes
3.2.17 Subsystem Log	The controller shall log all directives, responses advisories, warnings and alarms with time tags to the nearest second. This log shall be maintained for at least 72 hours. For data older than 72 hours, The controller shall have the capability to transfer data to a permanent storage media.	Yes
3.2.18 Graphics Displays	The controller shall generate graphical displays consisting of subsystem configurations and alphanumerics representing the current hardware status. Current hardware status shall show actual positions, not the commanded positions.	Yes
3.2.19 Graphics Display Content	The graphic displays shall include but not limited to configuration names and status indicators. The displays shall clearly indicate failed elements and automatically update when conditions change.	Yes
3.2.19.1 Uplink Path	The CCG shall identify all ? Uplink Paths? for all configurations that direct RF radiated power from the Transmitter to the aperture of the antenna for each station	Yes

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.2.20 Test Signal Configuration	The test signal path configuration shall be included in the graphics displays	Yes
3.2.21 Uplink Path	The graphics displays shall clearly show the Uplink and Downlink Paths through the system.	Yes
3.2.22 Display Location	All displays shall be available from any location (Local FEA, Remote SPC and NMC.)	Yes
3.2.23 Alarms	The controller shall generate and send all advisories, warnings and alarms to any control location. These advisories, warnings and alarms shall state the source of the alarm and corrective action required	Yes
3.2.24 Interlock Violation	The controller shall determine and report all sources of ? safe to transmit? interlock violations. The report shall include recommended corrective actions.	Yes
3.3 Personnel Safety and Equipment Protection	The UWV Subsystem shall coordinate inter-subsystem Interlocks including indicator, enables and inhibits to provide personnel safety and system equipment protection.	Yes
3.3.1 10 Degree Elevation Limits	The RF system shall prohibit RF Radiation below 10 degrees elevation.	Yes
3.3.2 Lockout Capability	The subsystem while in local control at the FEA shall provide a lockout capability to prevent directives from configuring the subsystem from either the remote SPC or NMC locations.	Yes
3.3.3 Interlock Timing	The RF system shall terminate the radiation of RF power in less than 300 msec.	Yes
3.3.3.1 ETX Interlock timing	The ETX shall terminate the generation of RF power in less than 100 msec when the UWV removes the enable signal for either the ? BEAM ON? or ? DRIVE ON? .	Yes

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.3.3.2 ANT Interlock Timing	The ANT shall indicate to UWV any position changes in less than 100 msec. This reporting shall include reflector positions and the 10 degree elevation indicators.	Yes
3.3.3.3 FEG/AEG Interlock Timing	The UWV FEG and AEG shall indicate a violation to the CCG of any personnel safety or equipment protection interlock the critical path in less than 100 msec.	Yes
3.3.3.4 CCG Interlock Timing	The UWV CCG shall sense a violation of any personnel safety or equipment protection interlock form any one of the ANT, FEG or AEG and disable the beam or drive signal in less than 100 msec. by removing the ? OK To Radiate? enable.	Yes
3.3.5 Subsystem protection	Each subsystem shall provide self protection for all internal sources of danger to personnel and equipment.	Yes
3.3.6 Antenna Mechanical Subsystem		Yes
3.3.6.1 ANT Indicators	The ANT shall provide position indicators for all switchable or retractable reflectors and the 10 degree elevation indicator to the UWV to be included in the Uplink path determination.	Yes
3.3.6.2 ANT Inhibits	The ANT shall accept Inhibit signals from the UWV and inhibit the movement of all movable mirrors or reflectors.	Yes
3.3.7 Exciter Transmitter and Transmitter Subsystems (ETX & TAR)		
3.3.7.1 ETX Indicators	The ETX shall accept enable signals from the UWV to enable the application of the drive signal to the Power Amplifier Assembly based on antenna position of 10 degrees elevation and above.	Yes

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.3.7.2 BEAM ON	The ETX shall present the ? BEAM ON? indicators from each transmitter to the UWV.	Yes
3.3.7.3 Beam On Command	The ETX shall require operator action to restore RF power generation after any interlock violation has terminated the radiated power. The RF power shall not be generate automatically after it has been terminated. Operator action shall be required.	Yes
3.3.8 Antenna Microwave Subsystem		
3.3.8.1 UWV Inhibits	The CCG shall inhibit the movement of elements that would result in damage to equipment if moved when the ETX is radiating.	Yes
3.3.8.2 UWV Interlock Alarm	The CCG shall send an alarm to NMC when the CCG terminates RF power.	Yes
3.3.8.3 Automatic Reset of Interlocks	The UWV shall not require an operator reset of interlocks. Interlocks shall automatically reset when the condition is changed or cleared.	Yes
3.3.8.4 NMC Remote Reset	The subsystem controller shall be capable of a remote reset of the CCG controller from NMC.	Yes
3.4 RF Radiation limits		
3.4.1 RF Safety Instrumentation	The RF Safety Instrumentation shall prohibit RF Radiation from any DSN station below the specified elevation limit or where the RF beam could intercept areas accessible by people, which ever is higher.	Yes
3.4.2 Elevation Limits	The elevation limit shall be defined as:	
3.4.3 Near Earth Transmission	For transmission in support of Near Earth missions in the minimum elevation angle is 5 degrees above the horizon.	N/A

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
3.4.4 Deep Space Transmission	For transmission in support of deep space missions the minimum elevation angle is 10 degrees above the horizon.	Yes
3.4.5 Structure Radiation Limits	The radiation limits near any structure shall be higher than the structure so that the RF beam clears the structure by 5 meters.	Yes
3.4.6 Personnel Radiation Limits	The radiation level in areas accessible to people shall be less than 1 mw/cm^2.	
3.5 Operability		
3.5.1 Maintainability	Subsystem controllers shall report any failure within the subsystem to the lowest replaceable element.	Yes
3.5.2 Availability		Yes
3.5.2.1 UWV Subsystem Availability	The availability of the UWV Subsystem shall be no less than 0.9961.	Yes
3.5.2.2 ANT Availability	The availability of the ANT subsystem shall be no less than 0.9961.	Yes
3.5.2.3 ETX Availability	The availability of the ETX subsystem shall be no less than 0.9961.	Yes
Appendix A		
4 Definitions	The following list defines specific terms used in this document.	
4.1 Uplink Path	The Uplink Path is defined to be the path by which the RF radiated power is directed from the transmitter to the aperture of the antenna. This path can consist of any combination of waveguide, cable, reflectors, and the space between reflectors.	Yes
4.2 Interlocks	Interlocks are mechanisms that automatically monitor, enable or inhibit the operation of equipment in the UWV Subsystem or adjacent Subsystem. The interlocks are divided into two categories 1) personnel safety (doors and hatches, etc) and 2) equipment safety (configurations, waveguide cooling flows, temperature, etc). The interlocks consist of indicators, enables, and inhibits.	Yes

828-1, Rev. 5 Requirements Compliance Matrix (continued)

828-1 Rev. 5 Section	828-1, Rev. 5 Requirement	CCG Design Compliance
4.3 Indicators	Each component involved in the configuration of the RF path provides a indicator of position and/or state of that element.	Yes
4.4 Inhibits	The transmitter and the interlock assembly generates inhibit signals that when active will prevent the movement or change in state of critical path components.	Yes
4.5 Downlink Path	The Downlink path is defined to be the path or paths by which the receive signal or signals are directed from the aperture of the antenna to the LNA.	Yes
4.6 Enables	The Interlock system generates enable signals that when active will allow the operation of critical path components.	Yes